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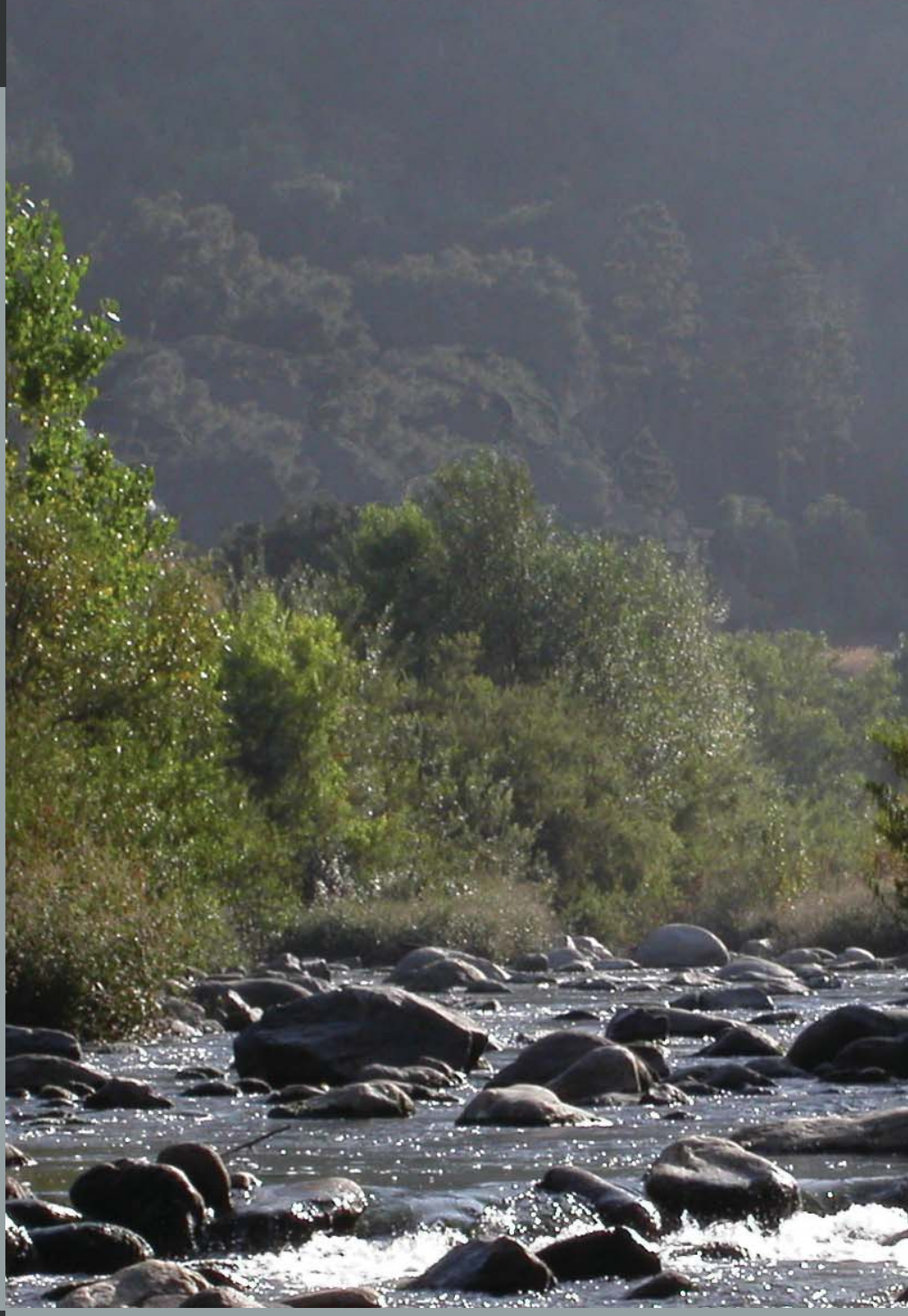
Water Supply Management Strategy



Technical Memorandum
May 15, 2006

Integrated Regional Water Management Plan For the Greater Los Angeles County Region

BROWN AND CALDWELL

Technical Memorandum for the Integrated Regional Water Management Plan for the Greater Los Angeles County Region prepared in partnership with:

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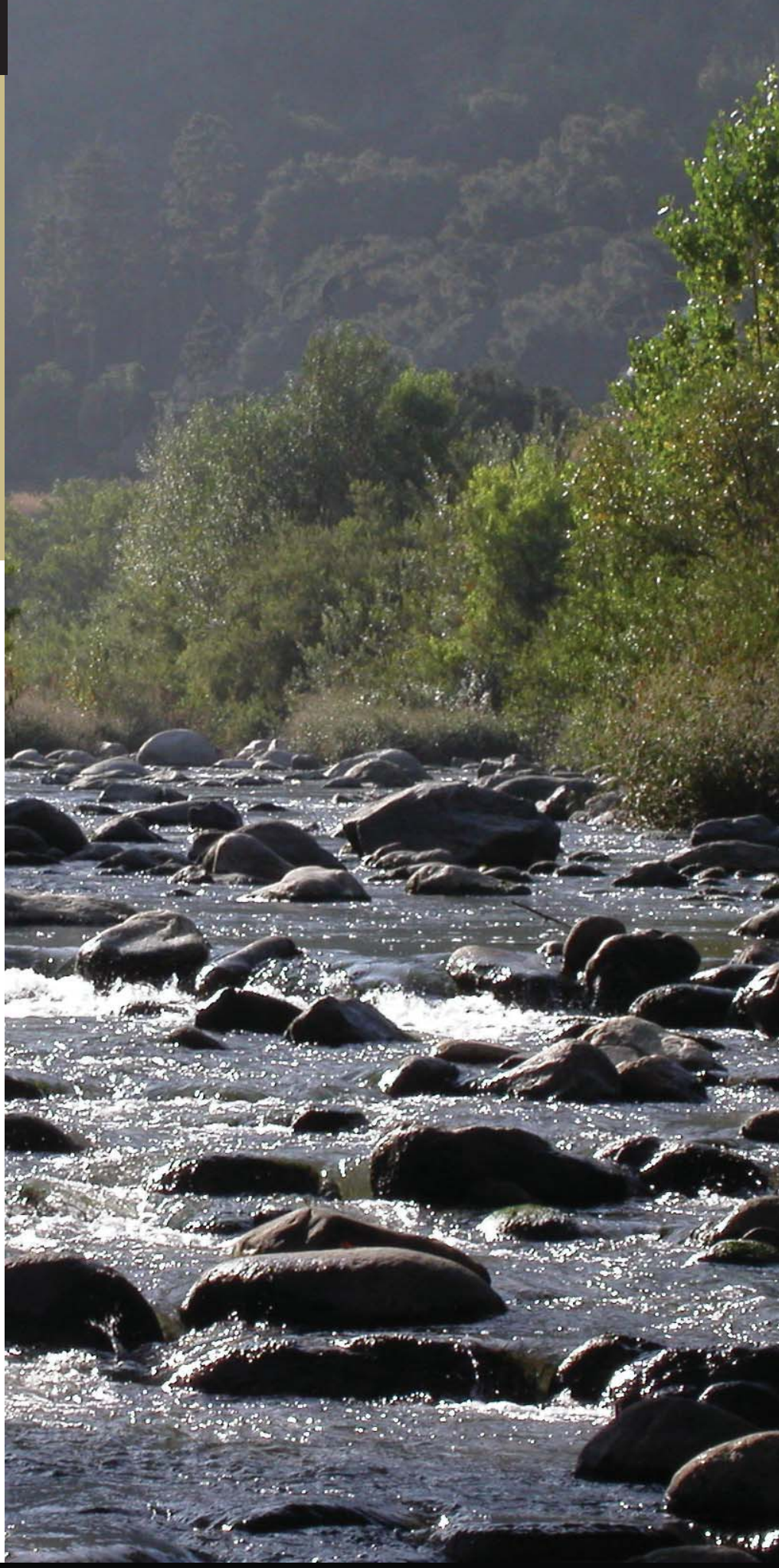

WATER SUPPLY
TECHNICAL MEMORANDUM

Prepared for

Leadership Committee of Greater Los Angeles
County Integrated Regional Water Management Plan

May 15, 2006

BROWN AND CALDWELL

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LIST OF ACRONYMS

ALW	Azuza Light and Water
AwwaRF	Awwa Research Foundation
BMP	Best Management Practice
BWRP	Burbank Water Reclamation Plant
CBMWD	Central Basin Municipal Water District
CCR	Covenants, Conditions, and Restrictions
cfs	Cubic Feet per Second
CII	Commercial, Industrial and Institutional
CIP	Capital Improvement Project
CRW	Colorado River Water
CUWCC	California Urban Water Conservation Council
CVP/SWP	Central Valley Project/State Water Project
CVWD	Crescent Valley Water District
CWD	Compton Water Department
CWEA	Cooperative Water Exchange Agreement
CWP	California Water Plan
DHS	Department of Health Services
DVL	Diamond Valley Lake
DWR	Department of Water Resources
EDC	Endocrine Disruptors
ET	Evapotranspiration
GAC	Granular Activated Carbon
GIS	Geographic Information System
GLACO	Greater Los Angeles County
GOU	Glendale Operable Unit
gpcd	Gallon Per Capita Per Day
GWP	Glendale Water and Power Department
GWR	Groundwater Replacement System
IRP	Integrated Resources Plan
IRWMP	Integrated Regional Water Management Plan
kWh	Kilowatts per Hour
JPA	Joint Powers Authority
LACDPW	Los Angeles County Department of Public Works
LACSD	Los Angeles County Sanitation District
LADPW	City of Los Angeles Department of Public Works
LADWP	Los Angeles Department of Water and Power
LafCO	Local Agency Formation Commission
LAG	Los Angeles – Glendale Water Reclamation Plant

LBWD	Long Beach Water Department
LLAR	Lower Los Angeles River
LPP	Local Projects Program
LRP	Local Resources Program
Metropolitan	Metropolitan Water District of Southern California
MCL	Maximum Contaminant Level
mgd	million gallons per day
M&I	Municipal and Industrial
MOU	Memorandum of Understanding
MTBE	Methyl Tertiary Butyl Ethylene
MWD	Municipal Water District
MWDOC	Municipal Water District of Orange County
NDMA	N-nitrosodimethlyamine
NIW	Non-Interruptible Water
NPL	National Priorities List
NSMB	North Santa Monica Bay
OCWD	Orange County Water District
PCE	Perchloroethylene
PhAC	Pharmaceutically Active Compound
PWP	Pasadena Water and Power Department
RBCUP	Raymond Basin Conjunctive Use Program
Region	Greater Los Angeles County Region
RFP	Request for Proposal
RUWMP	Regional Urban Water Management Plan
SCCWRRS	Southern California Comprehensive Water Reclamation and Reuse Study
SCHR	South Coast Hydrologic Region
SDWA	Safe Drinking Water Act
SFB	San Fernando Basin
SGR	San Gabriel River
SJCWRP	San Jose Creek Water Reclamation Plant
SMURRF	Santa Monica Urban Runoff Recycling Facility
SWB	Sea Water Barrier
TCE	Trichloroethylene
TDS	Total Dissolved Solids
TM	Technical Memorandum
TOC	Total Organic Carbon
TP	Treatment Plant
TSD	Trifuno Sanitation District
TMWD	Torrance Metropolitan Water District
TVMWD	Three Valleys Metropolitan Water District
TWRF	Tapia Water Reclamation Facility
ULAR	Upper Los Angeles River

ULARA	Upper Los Angeles River Area
ULFT	Ultra Low Flow Toilet
UWMP	Urban Water Management Plan
VOC	Volatile Organic Compound
WNWRP	Whittier Narrows Water Reclamation
WRD	Water Replenishment District
WSDM	Water Surplus and Drought Management
WTF	Waste Treatement Facility
WTP	Water Treatment Plant

1. INTRODUCTION

The Greater Los Angeles County Region (Region) is developing an Integrated Regional Water Management Plan (IRWMP) that will provide a framework to identify strategies that address the Region's water management issues. The IRWMP project will produce five main deliverables, with other supporting deliverables as identified throughout the project process. The five main deliverables consist of the following:

1. IRWMP. The document that summarizes the planning and integration efforts, and presents the recommended processes for implementing projects
2. Water Supply Technical Memorandum (TM). A memo that summarizes the water supply issues in the Region and develops proposed implementation strategies.
3. Water Quality TM. A memo that summarizes the water quality issues in the Region and develops proposed implementation strategies.
4. Open Space TM. A memo that summarizes the recreation, open space, and environmental habitat issues in the Region and develops proposed implementation strategies.
5. Integrated TM. A memo that collates the proposed strategies from the three main memos into an integrated approach to best resolve the Regional water management issues.

This TM presents the water supply background information and existing conditions. Water supply issues, opportunities, and constraints in the Region are also presented. Using this framework, the TM presents the Regional water supply objectives as developed within this process, from previous studies, and as presented in the California Water Plan. With the objectives established, the TM describes the strategies already in implementation and develops additional water supply strategies to achieve the objectives. These water supply strategies are further integrated in the Integrated TM with strategies from the other TMs to develop an overall implementation plan.

Information from this TM will be incorporated into the Regional IRWMP. That information will include:

1. The water demands for the Region;
2. The existing water supplies available for the Region;
3. The gap between demands and supplies;
4. Water management strategies and projects that are currently being used to meet water supply demands; and
5. Opportunities to further develop water management strategies and projects to meet the gap in demands and supplies.

1.1 Water Supply Summary

By 2025, there will be a gap of 850,000 acre-feet in supplies to meet urban water demands during a dry year. The Region faces many issues, constraints, and opportunities with respect to integrating water management strategies to improve water management and reduce the supply gap. The Region's agencies have been working for many years to resolve the water supply issues. As a result, there are many strategies available to

meet the IRWMP objectives and multiple solutions can be created to benefit the Region. Many projects already in implementation or planned for implementation incorporate integrated strategies consistent with the IRWMP objectives. Increasing and expanding the integration and regional planning efforts to include water quality and environmental needs will further enhance the Region's water supply management.

1.2 Background

Water supply agencies in southern California have been contending with limited local supplies for almost 100 years. In response, projects were constructed to import water from the Owens River, Mono Lake, Colorado River, and northern California. Importing water from these projects has its own set of uncertainties caused by both hydrologic and regulatory events. For example, the State Water Project (SWP) has limited reservoir capacity. A single dry year can result in a significant drop in the amount of water allocated to the SWP contractors. Additionally, Endangered Species Act restrictions could result in a decrease in the amount of pumping from the Delta, limiting the amount of water that can be exported to southern California.

As the uncertainties of these imported sources have become apparent, the water supply agencies have made significant progress to develop further local water supplies to meet increasing demands. These include:

- Recycled water;
- Desalination;
- Conservation;
- Treating contaminated groundwater;
- Conjunctive use;
- Transfers; and
- Captured runoff (non-urban and some urban)

The Region's agencies continue to encounter challenges in implementing local supply projects such as:

- **Cost.** Agencies are typically unable to develop local supplies if the net costs are greater than paying for imported water. This is particularly true for agencies that are governed by the Public Utilities Commission regulations.
- **Water Quality.** Contaminants in water supplies may limit use because of either lack of technology to treat the supply or the cost of treating those supplies. As more contaminants are identified, the use of water resources becomes more limited.
- **Institutional/Legal Constraints.** The complex institutional framework of water agencies combined with the legal constraints, including groundwater basin adjudications, can limit their ability to be able to find solutions to water resource problems.
- **Regulatory Constraints.** Permitting and other regulatory hurdles may make certain projects infeasible. For example, conjunctive use through injection wells may not work in some cases because the Regional Water Quality Control Board (RWQCB) limits the type of water that may be introduced into an aquifer.
- **Public Perception.** Public perception can be a major hurdle in the use of certain supplies. For example, recycled water use has had a stigma attached to it that has been challenging for the public to accept in some cases.

The State of California (State) recognizes that areas throughout the State are subject to similar water supply issues and project implementation constraints. In an effort to improve water supply management throughout the state, California has developed the IRWMP process. The IRWMP is expected to provide a broader

context and platform for projects to be evaluated within, allowing for a comprehensive understanding of regional impacts. With the IRWMP, it is anticipated that many of the single project implementation issues can be better resolved to affect positive changes to water management throughout the state.

The State is providing grant funding for regions throughout the State to develop IRWMPs and to implement projects recommended by the process. The State provided some guidance on suitable regions in an attempt to group common watersheds, supplies, and/or infrastructure. In response, the greater Los Angeles area water agencies and purveyors have joined together to develop this IRWMP. The Region is shown in Figure 1-1 and generally includes the Los Angeles River and San Gabriel River Watersheds. The Region was divided into five sub-regions.

Figure 1-1. Region and Sub-Region Boundaries

1.3 Existing Conditions: Water, Wastewater, and Other Service Entities

This section provides basic information on sources of water supply, including water agencies, wastewater agencies, and other services entities. More detailed information is provided in Appendix A.

1.3.1 Regional Water Agencies and Member Agencies

There are two regional water agencies that provide imported water supplies to the Region; 1) Metropolitan Water District of Southern California (Metropolitan) and 2) San Gabriel Valley Municipal Water District (MWD). Both agencies import and distribute water to their own member agencies, and neither provides water to retail customers. Metropolitan was incorporated in 1928 with the primary purpose of delivering Colorado River water to the coastal southern California area. As demands increased, Metropolitan became a

SWP contractor and also began importing water from northern California. The entire service area population is approximately 18,233,800 in 2005 and is projected to increase to 21,367,500 in 2025. Metropolitan's service area covers the southern California coastal plain and includes portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura Counties. Metropolitan's service area comprises roughly 70 percent of the 2,058 square mile IRWMP Region. Figure 1-2 shows Metropolitan's service area, and Figure 1-3 shows Metropolitan's service area within the Region. The dotted lines in Figure 1-3 reflect the IRWMP sub-regions.

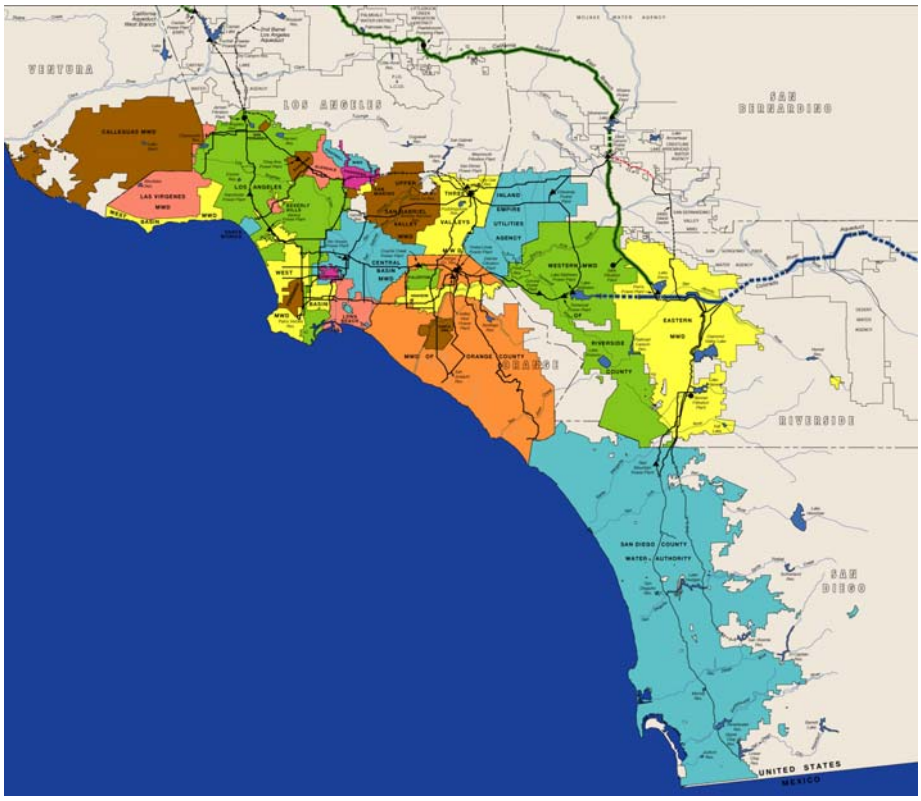


Figure 1-2. Metropolitan Water District of Southern California

Source: Metropolitan Water District of Southern California

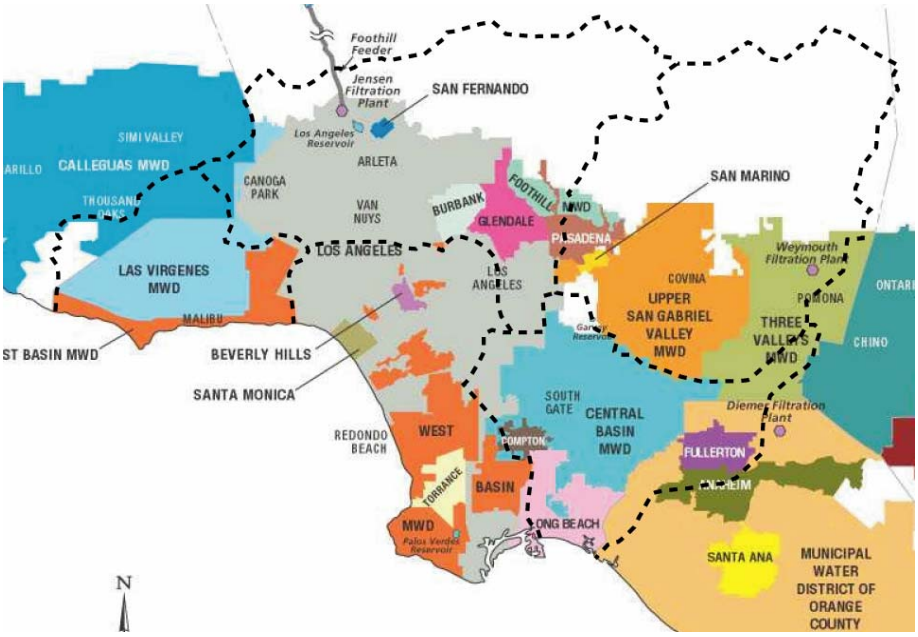


Figure 1-3. Metropolitan Service Area within IRWMP Region

Source: Metropolitan Water District of Southern California

Metropolitan has 26 member agencies. Each member agency varies in size, amount of water deliveries, and mix of water supplies. Metropolitan's member agencies in the Region include the Cities of Beverly Hills, Burbank, Compton, Fullerton, Glendale, Long Beach, Los Angeles Department of Water and Power (LADWP), Pasadena, San Fernando, San Marino, Santa Monica, Torrance, West Basin MWD, Upper San Gabriel MWD, Three Valley MWD, Municipal Water District of Orange County (MWDOC), Las Virgenes MWD, Foothill MWD, Central Basin MWD, and Calleguas MWD.

San Gabriel Valley MWD was formed in 1959 to meet the supplemental water needs of its member agencies. These agencies are the Cities of Alhambra, Azusa, Monterey Park and Sierra Madre, all located in the San Gabriel Valley. San Gabriel Valley MWD has one pipeline with five turnouts that it uses for groundwater recharge purposes. The service area population is estimated to be 217,000 in 2005 and projected to increase to 255,000 by 2025. The service area covers a total of 27.2 square miles. However, this service area is not contiguous, since the member agencies are not all adjacent to each other.

1.3.2 Groundwater Basins

The Region has several groundwater basins underlying the area varying in size, yield, conjunctive use potential, sediment type and water quality. Figure 1-4 shows the groundwater basins within the watershed area.

Source: Metropolitan Water District

Figure 1-4. Groundwater Basin Map

The institutional construct to manage these basins also varies from minimal management to highly managed through either legislation or adjudication. These basins and types of management are described in more detail in Appendix A.

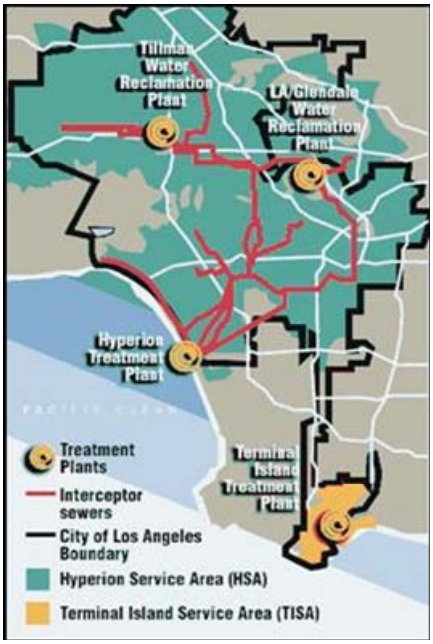
1.3.3 Sanitation Districts and Other Wastewater Treatment Agencies

Wastewater treatment services within the Region are currently the responsibility of primarily two wastewater agencies: (1) County Sanitation Districts of Los Angeles County (LACSD), and (2) City of Los Angeles Department of Public Works, Bureau of Sanitation (LADPW). Figure 1-5 illustrates the location of the 11 wastewater treatment plants that the two agencies operate within the planning area.

LACSD Treatment Plants

Source: www.lacsd.org, 2006.
Note: Lancaster and Palmdale treatment plants are outside of the planning area.

LA City Bureau of Sanitation Treatment Plants



Source: www.lasewers.org, 2006.

Figure 1-5. LACSD and LADPW Plant Locations

A few other public agencies provide wastewater treatment services in Los Angeles County, but have a much smaller service area within the planning area:

- Las Virgenes MWD, under a joint partnership with Triunfo Sanitation District, provides wastewater services for 80,000 residents in western Los Angeles. This system connects to the Tapia Reclamation Facility and to the Los Angeles sanitation sewer system.
- The City of Burbank Public Works Department provides wastewater treatment services for residents within their boundaries at the Burbank Water Reclamation Plant. All solids from the Burbank Water Reclamation Plant are conveyed to the Hyperion Treatment Plant owned and operated by Los Angeles sanitation for treatment via the sewer system.
- Los Angeles County Department of Public Works (LACDPW) owns and operates the Malibu Mesa Wastewater Treatment Facility, which produces approximately 140 acre-feet per year (acre-feet/year) of tertiary-treated effluent (LafCO Municipal Service Review Report, Water Service - Las Virgenes Region (2004)).
- West Basin MWD operates two tertiary treatment plants that treat secondary effluent from the Hyperion Treatment Plant.

Overall, there are currently 13 main wastewater treatment plants within the planning area plus the two West Basin MWD tertiary treatment/advanced treatment plants, for a total of 15 treatment plants.

Some of key information relevant to this TM is presented below:

- The secondary treatment permitted capacity within the Region is 1,200 million gallons per day (mgd). Existing plans for expansions by LACDPW (including nitrification/denitrification projects) would increase this capacity to approximately 1,270 mgd.

- The current secondary treated effluent annual average flows total approximately 920 mgd.
- There is no reuse of secondary treated effluent within the Region, only tertiary treated effluent.
- The tertiary and advanced treatment permitted capacities within the Region totals approximately 320 mgd and 20 mgd, respectively. Existing plans for expansions by West Basin MWD and LACDPW would increase the combined capacity by approximately 45 mgd to 385 mgd.
- The current tertiary and advanced treatment annual average flow is 225 mgd, which represents approximately 25 percent of the current secondary treated effluent annual average flows.
- Of these 225 mgd, approximately 107 mgd (120,000 acre-feet/year) are currently reused for municipal and industrial applications, environmental uses, groundwater replenishment, or seawater barrier. The re-used flows represent approximately 45 percent of the available tertiary treated water. The rest of the 225 mgd is discharged to local streams/rivers or directly into the ocean.

Other information such as discharge point for treated effluent, current permitted secondary and tertiary capacities, and recycled water average flows for each of these 15 main treatment plants is presented in Appendix A. Figure 1-6 illustrates the location of the 15 main treatment plants compared to the Metropolitan member agencies service area boundaries.

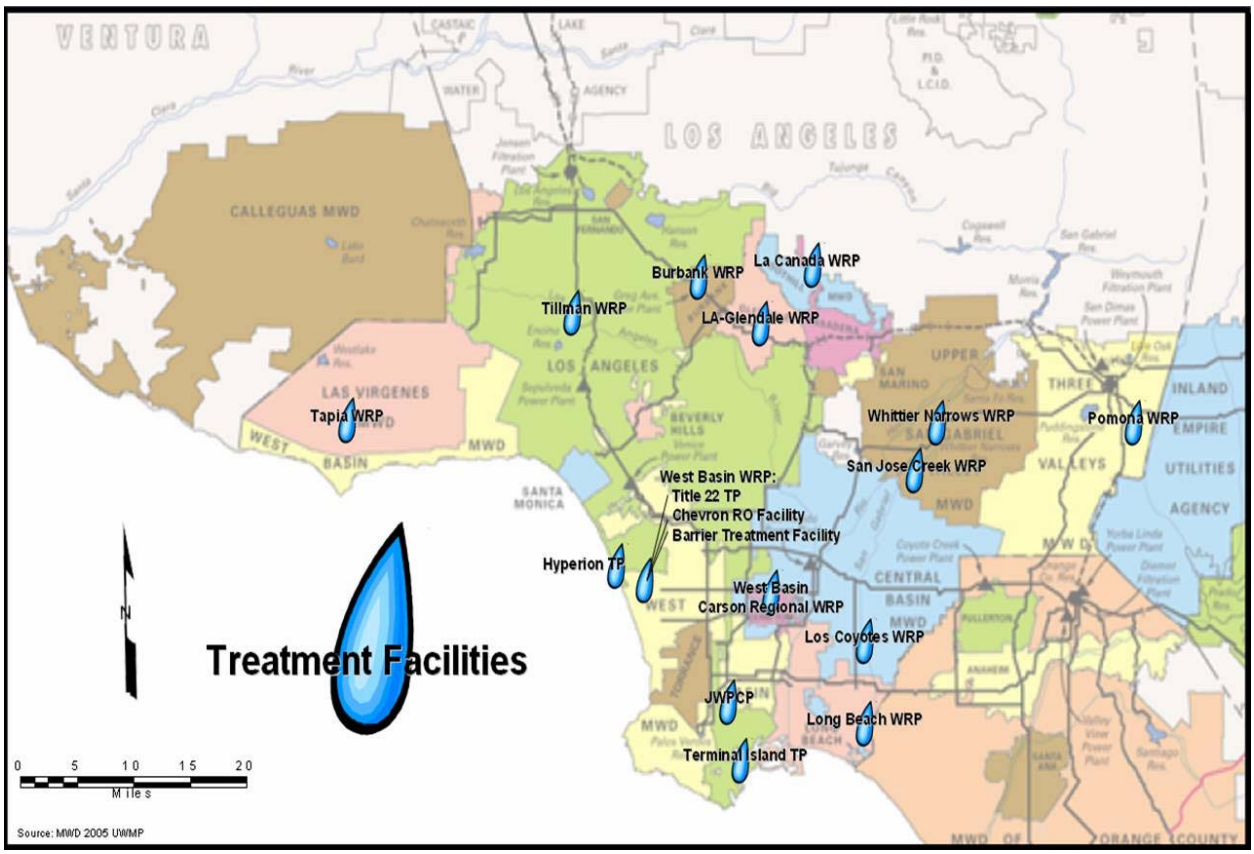


Figure 1-6. Main Wastewater Treatment Facilities in Planning Area

Notes: Location of treatment facilities is approximate. Only main wastewater treatment facilities with a permitted capacity of 0.2 mgd or more are listed, which excludes Los Angeles County Malibu Mesa Water Treatment Facility. Existing or planned urban-runoff treatment facilities are not shown.

1.3.4 Physical System for Delivering Water

The major facilities used to deliver water and recharge facilities within the Region are described below.

1.3.4.1 Regional Water Agency Facilities

Metropolitan's facilities begin with the Colorado River Aqueduct. This 242-mile facility stretches from Lake Havasu to Lake Mathews and can deliver up to 1.3 million acre feet annually. Five pumping plants are needed to lift the water over several mountain ranges from Lake Havasu to Lake Mathews in Metropolitan's service area. Approximately 2,000 kilowatts per hour (kWh) is required to move an acre-foot of water from Lake Havasu into the Metropolitan service area.

The water from this source, along with water taken from the SWP, is delivered to Metropolitan's 26 member agencies through a 775-mile regional network of canals, pipelines and tunnels, filtration plants, reservoirs, hydroelectric power plants, and other appurtenant facilities. Metropolitan has five treatment plants to process raw water, three of which (Jensen, Weymouth, and Diemer) can provide treated water within the Region. Additionally, Metropolitan has nine reservoirs that it may use for operational purposes and/or to augment supplies. These reservoirs range in size from Diamond Valley Lake in Riverside which has a storage capacity of 800,000 acre-feet, to Orange County reservoir which has a storage capacity of 212 acre-feet. Four of the reservoirs - Live Oak, Garvey, Palos Verdes, and Orange County - are in the Region.

Most of the water that Metropolitan delivers to its member agencies is by gravity feed. Metropolitan has been able to take advantage of the drop in elevation in some of its feeders by constructing hydroelectric power plants in its distribution system. In total, 16 hydroelectric power plants have been constructed. Seven are in the Region.

San Gabriel Valley MWD has one transmission line that delivers raw water from the SWP as shown in Figure 1-7. The Devil Canyon-Azusa Pipeline begins at Devil Canyon and ends at San Gabriel Canyon Spreading Grounds. The 55 cubic feet per second (cfs) pipeline has four outlets from which water can be spread. Additionally, it has a 1.05 megawatt hydroelectric power plant at the San Dimas turnout to generate electricity in conjunction with its supplemental water deliveries.

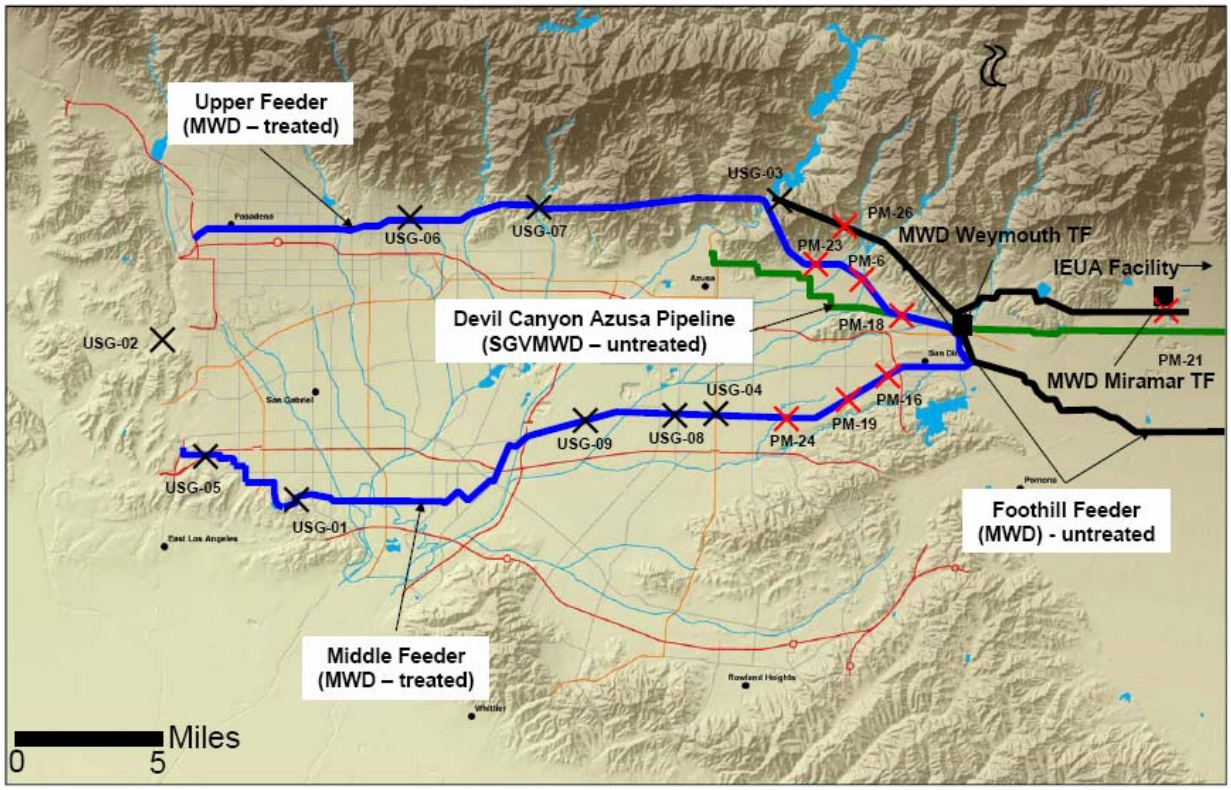


Figure 1-7. Azusa Pipeline

There is discussion of extending this pipeline to the Raymond Basin to deliver raw water for replenishment purposes. The City of Sierra Madre, a San Gabriel Valley MWD member agency, and Foothill MWD have shown interest in such an extension.

1.3.4.2 Recharge Facilities

The recharge facilities in Los Angeles County are generally owned and operated by the LACDPW. Pasadena also owns recharge facilities. LACDPW currently owns 27 spreading facilities in the County, where it recharges imported water, local runoff, and recycled water. These spreading facilities are generally located along the main water courses and their tributaries, and can be categorized by four major geographic areas: San Fernando Valley, San Gabriel Valley, San Gabriel River Percolation Reach, and Coastal Plain. Most of these facilities are operated through a system of dams, reservoirs, controlling gates and valves, and diversion structures. The total gross acreage of spreading grounds in Los Angeles County is 3,361 acres of which LACDPW operates 2,436 acres.

2. ISSUES, CONSTRAINTS, AND OPPORTUNITIES

This section presents current water supply issues, constraints, and opportunities. Elements are based on review of literature and planning studies and interactions with stakeholders in the five sub-regions of the Region. Table 2-1 summarizes the current Region's water supply situation. Elements presented are a broad assessment, with many of the constraints and opportunities applicable to resolving one or more of the issues.

Table 2-1. Issues, Constraints, and Opportunities Summary

Issues	Constraints	Opportunities
• Reliance on imported water • Dry year reliability • Groundwater basin restrictions • Low reuse utilization • Groundwater contamination • Surfacing of groundwater • Increasing impervious surface coverage	• Lack of funding • Groundwater contamination • Limited spreading capacity • Complex institutional and legal framework • Private property rights • Recycled water use constraints • In-stream and habitat flow needs • Stormwater location and quality • Desalination implementation unknowns • Water use habits • Body contact in reservoirs • Detention/spreading basin operational needs • Facility security	• Increase reuse utilization • Increase conservation • Utilize storm water for supply • Increase groundwater basin management • Improve and replace infrastructure • Desalination • Regulatory compliance projects • Gray water use • Storage in flood control facilities

2.1 Issues

Growth in southern California combined with limited and sometimes contaminated supplies causes issues for purveyors as they try to meet customer needs. These issues listed below must be addressed to continue meeting 100 percent of demands in dry years.

2.1.1 Reliance on Imported Water

Population growth has increased the Region's dependence on imported water supplies to augment local supplies. Continued prosperity and economic development in southern California depends on acquisition and careful management of both local and imported water supplies (including transfers).

2.1.2 Water Reliability in Drought Years

Per capita water use declined in the early 1990s as a result of economic recession, conservation, and drought impacts despite significant population growth during this period. As a result, total water demand continues to

rise within the Region. Both the SWP watersheds and the Colorado River Basin periodically experience drought conditions. Increased water demands and operating constraints imposed on those systems create periodic water shortages that jeopardize the economy of the Region. This reality provides an impetus for local resource optimization projects and programs.

2.1.3 Groundwater Basin Storage Capacity

There are substantial groundwater basin assets in the Region including major aquifers such as the Main San Gabriel Basin, the Central Basin, the West Basin, and the San Fernando Basin. Many of the basins have elaborate institutional structures and operational strategies that have developed over the years. There are some sub-regions within the basin that have very limited groundwater resources and other basins where groundwater requires advanced water treatment to be usable. However, there is still potential for groundwater basin storage capacity expansion.

2.1.4 Unused Wastewater Effluent

Substantial wastewater is generated within the Region that is not reused, some of it due to infrastructure limitations, and some due to regulatory constraints on the amount of recharge allowed by the Department of Health Services. While there are elaborate and world-class recycled water projects in place, additional wastewater effluent could be treated and reused. This use could reduce the need for imported water and have important ecosystem benefits in the areas of origin of imported water, especially during critical drought periods. Accordingly, water agencies in the Region support the expansion of water recycling through special funding programs that help underwrite the sometimes costly infrastructure necessary to produce and distribute high quality recycled water.

2.1.5 Areas of Groundwater Contamination

Industrial, commercial, military, and agricultural practices over the Region's history have contributed significant contamination to the groundwater basins. Some areas of basins are unusable due to seawater intrusion, volatile organic compounds (VOC) contamination, perchlorate contamination related to military applications, nitrate due to agricultural operations, and total dissolved solids (TDS) from historic use of relatively saline Colorado River water for groundwater recharge. Recycled wastewater effluent that has not been desalted contributes additional salt to the basins.

2.1.6 Avoidance of Elevated Groundwater Levels

Groundwater elevations vary with local hydrology and must be managed to avoid surfacing of groundwater in some basins (e.g., Main San Gabriel Basin).

2.1.7 Increased Percent of Impervious Surfaces

The urbanization of the Region has resulted in a significant percentage of the surface area being impervious to rain and infiltration. This creates substantial runoff during storm events that must be managed to avoid property damage and risk to life.

2.2 Constraints

As water purveyors try to address the issues listed above, they run into constraints that they must overcome in order to develop supplies. These constraints are listed below.

2.2.1 Lack of Funding

The construction of water infrastructure and implementation of water management programs is expensive. Significant funding constraints exist at virtually every level of local government. The Region has invested significant funding to develop cost-effective water supplies over the last century. The most cost-effective projects have been completed. Increasing investments will be required to develop the remaining opportunities. The marginal cost of water supplies in the Region is over $600 per acre-foot and many projects cost $1,000 per acre-foot or more.

2.2.2 Groundwater Contamination

Increasing the use of groundwater supplies is constrained by pervasive groundwater contamination. Aggressive programs to treat, recover, and reuse these contaminated supplies exist in virtually all the groundwater basins in the area. The management of several basins revolves around the occurrence of contamination and the need to limit the movement of contaminant plumes. This operating constraint can significantly limit the potential of these basins to expand water yield.

Water from the Colorado River Aqueduct has elevated salinity levels that vary with the hydrology in the Colorado River Basin. This salinity represents a constraint on the use of Colorado River Water for replenishment (e.g., in the Main San Gabriel Basin). Long-term salinity projections on the Colorado River do not offer encouragement that this constraint will diminish.

Numerous groundwater basins are not used at all by agencies because of contamination. These agencies use imported water as an alternative water supply.

2.2.3 Limited Spreading Capacity

Expanded conjunctive use has been hampered by the lack of spreading capacity to capture and infiltrate local or imported water supplies. This is in part due to the space requirements implicit in spreading operations and the high cost of land in the Region.

2.2.4 Complex Institutional and Legal Issues

The long history associated with water and water rights in the Region has created a patchwork of institutions and water rights rulings that enable and, at times, constrain effective water management. Navigating these issues is time consuming and expensive.

2.2.5 Private Property Rights Issues

Use of gravel pits for water supply must consider that these pits are private property and, in many cases, active commercial enterprises. The owners have legal responsibility to "restore" the sites once mining operations cease.

2.2.6 Constraints on Recycled Water Use

Advanced water treatment processes and distribution pipelines are generally required to expand the use of recycled water. Constructing pipelines in urbanized areas is increasingly difficult. In recent years increasing attention has focused on the presence of trace levels of contaminants in water and wastewater referred to as endocrine disruptors (EDCs) and pharmaceutically active compounds (PhACs). These contaminants are not thought to be of human health concern because of the minute concentrations at which they typically occur but may present a risk to aquatic species. Depending on the course of research and regulation, EDCs and

PhACs may constrain the expanded use of recycled water or require advanced and costly levels of treatment to manage.

2.2.7 Constraints on In-stream Flow Needs and Habitat Needs

Modification of existing flow regimes in waterways must consider the impacts on existing species in those waterways that have adapted to the ephemeral flow nature. Projects that optimize water supply may find that impacts to native species in these water ways become constraints to implementation.

2.2.8 Constraints on Stormwater Capture and Yield

Captured and infiltrated storm water will only augment ground water resources in unconfined aquifers (where impervious layers do not constrain recovery of the water). Poor quality infiltrated storm water could also require costly treatment to recover and reuse.

2.2.9 Brackish Water Desalination Constraints

Constraints associated with brackish water desalination include power consumption and membrane replacement costs and the need for brine disposal.

Seawater desalination constraints include the risk associated with navigating an unclear and convoluted permitting process, power costs, facility citing opposition, interconnection of coastal desalination plants with existing water distribution systems and water production costs.

2.2.10 Conservation Ethic

While great strides in conservation have occurred in the Region, a constraint to even greater conservation may be the willingness of the consumers in some areas of the Region to change their water use behaviors. However, as planned water infrastructure is constructed and water rates become generally more expensive, additional conservation may occur as ratepayers respond to higher prices by reducing consumption.

2.2.11 Body Contact in Reservoirs

Body contact recreation in reservoirs could present public health concerns related to use of these supplies for domestic water.

2.2.12 Need for Cycling of Detention Basins and Spreading Grounds

The spreading grounds must undergo periodic drying and maintenance (e.g., silt removal) and could represent a constraint to year round water flow.

2.2.13 Security of Facilities and Supplies

Security measures could significantly limit public access to water supply facilities.

2.3 Opportunities

Along with the constraints listed above, there are still opportunities available to develop local supplies. These opportunities are listed below.

2.3.1 Recycled Water Surplus

The wastewater agencies in the Region are handling the domestic and commercial wastewater streams from a population of nearly 10 million people. World class water recycling programs are in place but additional wastewater could be recycled and put to beneficial use.

2.3.2 Additional Conservation

The Region has been a world leader in water conservation programs. For example, over one million low-flow toilets have been installed by the LADWP. As a result of this and other programs, per capita water consumption has declined over the last two decades. Metropolitan has provided programs and funding to encourage adoption of state of the art conservation technology including horizontal axis clothes washers and ET controllers and has recently increased the conservation targets in the 2003 update of its Integrated Resources Plan (IRP). Nonetheless, additional conservation opportunities exist that could be achieved by providing additional financial incentives for residential, commercial, and industrial conservation.

2.3.3 Capture, Treatment, and Reuse of Stormwater

Significant quantities of stormwater have been historically captured and infiltrated into groundwater basins. Additional opportunities for capture, treatment, and reuse of stormwater exist. Large storm events discharge hundreds of thousands of acre-feet of stormwater into the ocean through the Region's waterways. Systems to capture and manage stormwater could develop significant water resources for the Region in addition to providing water quality management, habitat, recreation, and open space values.

2.3.4 Groundwater Management Programs and Treatment

The Region has sophisticated systems for managing groundwater. Programs to increase local storage in groundwater basins have been enacted. Cyclic and seasonal storage programs have been used. Agreements are in place allowing delivery and replenishment of water into groundwater basins in advance of agency demands. Currently, focus has been on long-term replenishment storage programs and contractual conjunctive use programs.

Conjunctive use refers to the coordinated operations of surface water supplies and groundwater supplies to optimize the recovery and use of both. Conjunctive use could be expanded through construction of additional spreading capacity or aquifer storage and recovery wells that would speed the injection of water into the basins. Increased replenishment capacity would enable the Region to capture additional water supply during large storm events, water that currently is discharged to the ocean. This expanded conjunctive use capacity would increase the Region's drought resiliency by providing added emergency backup during imported water shortages.

Construction activity in the Region has spawned active sand and gravel mining operations in the Los Angeles River and San Gabriel River watersheds. Some of the gravel pits in the Region are currently inactive. The pits could provide water storage and stormwater retention opportunities that have yet to be leveraged (see constraints below for limitations). The pits are adjacent to the waterways and represent a potential opportunity to meet multiple water resource objectives.

Some groundwater use has been limited by the occurrence of groundwater contamination (see constraints below). Installing systems to manage and treat contamination could increase water resource opportunities.

2.3.5 Water System Improvements

Water and wastewater systems in the Region contain physical facilities that are reaching the end of their effective life (in some cases over 75 years old). Nearly 80 percent of a utility's assets are underground. These physical facilities include pump stations, storage tanks, reservoirs, piping, treatment facilities, supporting infrastructure, etc., and will require rehabilitation and/or replacement in order to continue to provide essential water and sewer service to the Region's population.

When an agency upgrades a system, an opportunity is created for any necessary expansions while construction is in progress. For most agencies, restoring aging distribution systems represents the largest CIP investment planned early in the 21st century.

As distribution systems are upgraded, more agencies are automating their systems. Automation can increase the chance of detecting system leaks early, improve water quality management, and reduce labor and operating costs.

Interconnection of water utilities (there are dozens of discrete systems in the planning area) can provide valuable redundancy and backup supply capability in the event of emergencies.

2.3.6 Desalination

Seawater desalination has become more economical due to recent breakthroughs in membrane technology and plant siting strategies. Metropolitan's IRP Update includes a target of up to 150,000 acre-feet/year for seawater desalination. LADWP, West Basin MWD, and Long Beach are considering desalination plants in their service areas. The first two plants are reverse osmosis facilities and the last is a dual nanofiltration process.

Additional research and supporting studies will be needed to move to construction of these facilities in the Region. Studies related to optimizing the treatment technology, development of pretreatment alternatives, determination of environmental impacts and mitigation measures and brine disposal management issues will be required.

Brackish groundwater desalination opportunities also exist. Historical agricultural activities, wastewater discharges, groundwater recharge with relatively salty Colorado River water and other human activities have contributed salt to the groundwater basins rendering water in some areas of the basins unusable without salt removal treatment.

2.3.7 Safe Drinking Water Act Compliance Projects

The Safe Drinking Water Act was passed by Congress in 1974 and has resulted in the promulgation of numerous drinking water regulations over the years. The regulatory process is a defined and systematic process that responds to contaminant occurrence, evaluates health effects and establishes health protective standards. The California Department of Health Services (DHS) has "primacy" for implementing and enforcing the federal standards in the planning area. Water systems must comply with these standards or face significant fines. Significant and costly water treatment has been required to date and there is the potential for further impacts to water systems as standards for perchlorate, N-nitrosodimethlyamine (NDMA), radon, disinfection by-products, reservoir covering and others are established. Both treatment facilities and system modifications may be required to comply with the standards. These modifications may provide opportunities for additional supply development.

2.3.8 Gray Water Use

The policy surrounding the use of gray water for landscape irrigation could be reexamined and active programs should be encouraged to reduce landscape irrigation requirements.

2.3.9 Flood Control Facility Use for Storage

Opportunities exist to examine the use of flood control facilities for storage of water (e.g., Santa Fe Dam).

3. WATER SUPPLY PLANNING OBJECTIVES

This Section discusses the current and projected Region's demands and supplies based on the review of readily available documents and discussion with agency staff. The SWP is first analyzed followed by Metropolitan's 2003 IRP Update. Those numbers are then used to derive targets for the Region as shown below.

Water demand and supply findings form the basis for quantifiable water supply objective. The water supply objective is to meet forecasted dry-year demand, using multiple supply sources, over the 20-year planning horizon for the Region.

3.1 California Water Plan

3.1.1 Background

The California Water Plan Update 2005 (2005 CWP Update) is the product of a collaborative process that brought together the Department of Water Resources (DWR) with water resource and supply stakeholders to form a sustainable water plan for the State. The plan describes short-term and long-term actions implemented at the state and regional level. In addition, various water resources management strategies are identified to sustain California's communities, economy, and environment, while providing methods to meet the State 2030 projected water demands.

3.1.2 Goals

DWR developed the 2005 CWP Update to define the roles of the State Government and the growing role of California's local regions in managing the State's water resources. The following goals represent the desired outcome over a 25 year planning horizon to year 2030.

- State government will support good water planning and management through leadership, oversight, and public funding;
- Regional efforts will play a central role in California water planning and management;
- Water planning and urban development will protect, preserve, and enhance environmental and agricultural resources;
- Natural resource and land use planners will make informed water management decisions; and
- Water decisions and access are equitable across communities.

3.1.3 Plan for Los Angeles County

Los Angeles County is within the boundary of the South Coast Hydrologic Region (SCHR) as defined in the 2005 CWP Update. The SCHR extends 250 miles along the Pacific Coast from Ventura County in the north to the international border with Mexico in the south. The SCHR has slightly more than half of the State population (54 percent) but covers only seven percent of the total land area in the State. This population is projected to grow from about 18 million to 25 million by 2030.

3.1.4 Water Supply and Use

The SCHR has developed a diverse mix of local and imported water supply sources. Local water resources include groundwater, recycled water, water saved through conservation, brackish water desalination, water transfer, and storage. Water is imported through the SWP, the Colorado River Aqueduct, and the Los Angeles Aqueduct. Figure 3-1 provides a graphical representation of the water resources used in years 1998 (wet year), 2000 (average year), and 2001 (dry year).

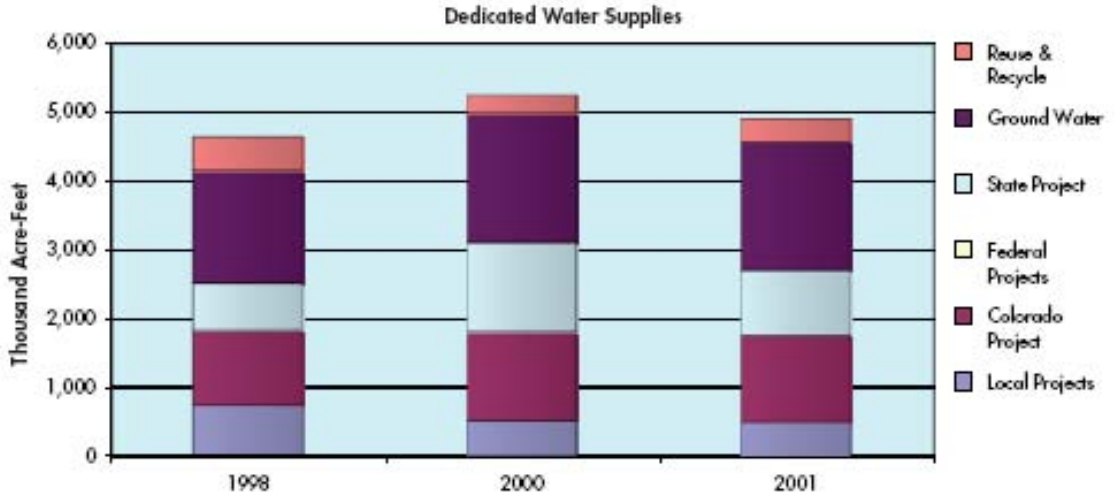


Figure 3-1. Water Resources Used in a Wet Year (1998), Average Year (2000), and Dry Year (2001)

(Courtesy: California Water Plan Update 2005, Volume 1)

Metropolitan and its member agencies have developed 85 percent of the SCHR's water supply. The remaining 15 percent of water supply is developed by water agencies located outside the Metropolitan service area. These agencies also import water from the SWP or use local supplies. Primary local supplies within the SCHR include groundwater, recycled water, and desalinated seawater. Groundwater is currently meeting about 23 percent of the normal year water demand in the region, and about 29 percent of dry year water demand.

Recycled water and desalinated seawater are two promising future resources in the SCHR. Available recycled water increases as regional population grows. Though the initial investment in developing the infrastructure for the recycled water system is high, cities and utilities in the SCHR are actively seeking opportunities to make the best use of this drought-proof resource. Seawater desalination could help eliminate concerns regarding decreasing water supply sources. Utilities in the SCHR are at the forefront of conducting studies to develop economically and environmentally feasible desalination processes. Many utilities in the SCHR plan to implement recycled water and desalination programs to balance the rise in demand triggered by population growth.

Another effective approach of eliminating the gap between future demand and supply employs aggressive conservation measures to manage and control increasing demand. Demand management techniques implemented through the use of effective Best Management Practices (BMPs) have caused unit water demands to decrease below historical averages in many service areas.

Other effective measures identified in the 2005 CWP Update that improve supply/demand management include capturing and utilizing urban surface water runoff, groundwater conjunctive use, groundwater remediation to increase groundwater supply, brackish water desalination, watershed management, groundwater banking, and water transfer from outside the SCHR. Utilities in the SCHR plan to use diversified strategies to manage available resources and develop new resources in a manner that allows greater flexibility when faced with water quality and supply challenges.

3.2 Metropolitan Planning

3.2.1 Background

After the 1987-1992 drought, Metropolitan began to develop a comprehensive water resource strategy to provide the Region with reliable and affordable water supply and address the issue of periodic shortages. The result was the 1996 IRP. This Plan was for a 20-year horizon and established regional targets to develop various types of supplies to meet 100 percent of demands during a dry year without interruption. These targets included conservation, recycling, groundwater conjunctive use, Colorado River and SWP supplies, and transfers.

The IRP was developed using a stakeholder driven process through an IRP workgroup. This workgroup included Metropolitan's Board of Directors, representatives from the environmental, agricultural, business and civic communities, Metropolitan staff, member agency and sub-agency managers, and groundwater basin managers. By assuring that the creation of the IRP was a collaborative effort, local projects and local plans achieved individual goals for resource management and development.

3.2.2 2003 Update for the Integrated Water Management Plan

In 2003, Metropolitan updated the IRP to address changing water supplies and extend the planning horizon to 2025 to comply with current water planning legislation. With the update, Metropolitan found that because of conservation and development of local supplies, the need for imported water has decreased. However, there was still a significant gap between demands and supplies developed to meet those demands.

Table 3-1 (from Metropolitan's 2003 IRP Update) reflects Metropolitan's change in demands from its 1996 IRP.

Table 3-1. Metropolitan Dry-year Demand Charges – 1996 IRP vs. 2003 Update, acre-feet/year

Category	1996 IRP	2003 Update	Change
Retail Demand – Before Conservation	6,083,978	6,046,510	-37,468
Conservation	882,000	1,027,600	145,600
Total Retail Demands with Conservation	5,201,978	5,018,910	-183,068
Direct Use LRP and Desalination	500,000	533,156	33,156
Local Surface and Groundwater	1,618,571	1,911,193	292,622
Total Local Supply – Direct Use	2,118,571	2,444,349	325,778
Total Metropolitan Direct Use Demand	3,083,407	2,574,561	-508,846

Because of the increased conservation and more aggressive development of local supplies, Metropolitan also updated its supply targets. It includes a 750,000 acre-feet planning buffer for supplies that is split between recycling, groundwater recovery and desalination, and Central Valley/SWP storage and transfers. This planning buffer acts as a contingency should supplies not be developed on schedule or should a supply that has been developed not be accessible when needed. A supply could not be accessible for a variety of reasons including water quality, infrastructure failure, institutional, and others.

Table 3-2 shows current projected local supplies for Metropolitan's service area, expected local groundwater and surface water production along with Los Angeles Aqueduct yield for 2010, 2015, 2020, and 2025, Metropolitan resource targets by 2010, 2015, 2020, and 2025 for conservation, local projects, groundwater conjunctive use, SWP, Colorado River Aqueduct, CVP/SWP Transfer and Storage, and Metropolitan Surface Storage and the gap or excess for local groundwater and surface water production and for each target for 2010, 2015, 2020, and 2025.

Table 3-2. Change in IRP Targets

	Supplies	IRP Targets (Demands)				Gap or (Excess)			
Type of Supply	Current	2010	2015	2020	2025	2010	2015	2020	2025
Conservation	730,000	865,200	946,400	1,027,600	1,106,900	135,200	216,400	297,600	376,900
Local Production (groundwater, surface water, LA Aqueduct)	1,295,300	1,808,966	1,860,080	1,911,193	1,922,608	513,666	564,780	615,893	627,308
Local Projects (recycled water, groundwater recovery, desalination)	273,000	410,000	580,000	750,000	750,000	137,000	307,000	477,000	477,000
Groundwater Conjunctive Use	107,000	275,000	287,500	300,000	300,000	168,000	180,500	193,000	193,000
State Water Project	460,000	463,000	556,500	650,000	650,000	3,000	96,500	190,000	190,000
Colorado River Aqueduct	740,000	1,001,000	1,064,500	1,250,000	1,250,000	261,000	324,500	510,000	510,000
CVP/SWP Storage and Transfers	417,000	300,000	425,000	550,000	550,000	(117,000)	8,000	133,000	133,000
MWD Surface Storage	870,000	620,000	620,000	620,000	620,000	(250,000)	(250,000)	(250,000)	(250,000)
Total	4,892,300	5,743,166	6,339,980	7,058,793	7,149,508	850,866	1,477,680	2,166,493	2,257,208

**The 1,250,000 acre-feet supply from the Colorado River Aqueduct is a target for specific year types when needed. Metropolitan is not expecting a full aqueduct in every year.*

***Target for Surface Storage is for total storage capacity, not dry year withdrawal yield.*

Note that there are excesses in two of the resource targets: CVP/SWP Storage and Transfers and Metropolitan Surface Storage. However, there are gaps in the others that in total are greater than these excesses. Thus, there is a total gap of about 2 million acre-feet in Metropolitan IRP targets and current supplies in 2025. Additionally, the current supplies for the SWP have not incorporated the Delivery Reliability Report 2005 since it has not yet been finalized. However, once that report is finalized and should the findings for a repeat of a single dry year remain as in the draft (a possible 5 percent SWP allocation), the gap between supplies and targets would widen.

Should all of these resource targets be developed, Metropolitan will be 100 percent reliable through 2025. However should no further resource targets be developed and using demands before conservation listed in the table above, Metropolitan would have a shortage of about 19 percent in a dry year.

3.3 San Gabriel Valley Water District Planning

San Gabriel Valley MWD currently only delivers spreading water to its member agencies. It has entered into a contract with Main San Gabriel Basin Watermaster where it may deliver water into the basin before it is needed. Should the Watermaster need replenishment deliveries to make up for production in excess of water rights by San Gabriel Valley MWD's member agencies and San Gabriel Valley MWD is not able to deliver water to the spreading grounds, it may sell water from its account to meet the Watermaster's needs. Thus, wet and normal years on the SWP are balanced with dry years and no further development of supplies is needed by San Gabriel Valley MWD.

3.4 Demand, Supplies, and Gap

The difference between current supplies and projected demands is evaluated to identify the amount of water supply that needs to be developed to meet future dry year needs. The IRWMP will help identify and integrate projects needed to fill this gap. In summary, by 2025, there will be a minimum gap of 850,000 acre-feet in supplies to meet urban demands during a dry year. The habitat demands are still under development, which will probably result in an even greater demand in 2025.

The following water supply goal for the region has been developed to meet the estimated gap:

> "Sustain current local water resources production capacity and quality and provide at a minimum 850,000 acre-feet of additional water supply and/or demand reduction through conservation."

This goal is for a dry year with multiple supply sources that also includes a planning buffer of supply volume exceeding the projected demand. This planning buffer is considered backup supply for other supplies that become unusable. The goal keeps the Region at status quo levels for imported water during a dry year. A larger volume will be required to meet the State goal of reducing demands on imported water. The goal does not include the latest DWR reliability study that is still in draft. That study shows yield from the SWP used by Metropolitan declining from the 35 percent to 5 percent.

The IRWMP's minimum water supply targets for the Region are based on Los Angeles County retail demands, Metropolitan's 2003 IRP Update, as well as population projections based on the portion of the IRWMP planning area within Orange County. The approach taken to develop the Region's numbers is based on this existing data, rather than through a detailed analysis because of time and resource constraints. When the IRWMP is updated, it is recommended that a more in-depth analysis be performed.

Demands without conservation in proportion to resource targets as provided in Metropolitan's 2003 IRP Update were used to derive the minimum targets for the Region. Current supplies in the area were then

compared against these targets to identify the gap. These current supplies are based on a survey sent to member agencies, urban water management plan (UWMP) information, and information provided by Metropolitan.

The San Gabriel Valley MWD targets are not included because it only provides replenishment water to the Main San Gabriel Basin at this time. These deliveries may be interrupted for periods of time and obligations for replenishment are then met through storage accounts in the basin. Thus, developing targets at this time is not necessary.

3.4.1 Urban Demand

Water demands not including conservation for the Region were derived as the first step in calculating the Region's targets. Los Angeles County's urban water demand and conservation volumes from Metropolitan's 2005 UWMP Tables A.1 -5 and A.1-12 were used for the Los Angeles County portion of Region's demands. However, because only a small portion of Orange County is in the Region, a different approach was developed for the Orange County portion of the IRWMP Region.

Population numbers for that small segment of Orange County were identified, along with a growth rate of 25 percent by 2025. Straight-line growth was assumed to project the annual population. Metropolitan's UWMP Table A.1-5 was used for the entire Orange County population for each year and the proportion of population of the Orange County segment of the Region compared to the remainder of Orange County was derived.

Urban water demands and conservation volumes for all of Orange County were obtained from Metropolitan's UWMP Tables A.1-5 and A.1-12. Water demands and conservation values are proportioned accordingly to the percentage of population for the Region's Orange County portion. Results are summarized in Table 3-3.

3.4.2 Pre-1990 Conservation Demand

Metropolitan's pre-1990 conservation of 250,000 acre-feet is reported as a total volume for their service area. The following describes how the volume was proportioned for the Region's study area.

1990 demand numbers are provided by Metropolitan in its UWMP Table A.1-5. Percentages of conservation were derived based on the ratio of Los Angeles County's 1990 demands and Orange County's demands to the total demands from Metropolitan. These percentages were then multiplied by 250,000 acre-feet to derive how much each agency within the Region conserved pre-1990. This method of deriving the pre-1990 conservation figures has likely provided a conservative number. Conservation for the Region is higher based on the significant push by agencies in the Region for conservation during that time period. Results are summarized in Table 3-3.

This pre-1990 conservation and the Los Angeles County and Orange County conservation numbers and water demands were added together to obtain the raw water demands for the Region. The Metropolitan retail demands plus conservation were added together to derive Metropolitan's raw water demands. The raw water demands for the Region were proportioned to Metropolitan's raw water demands to derive a percentage that would be used to derive the supply development targets for the Region.

Table 3-3. Proportion of Region's Demands					
Demands (acre-feet/year)					
	2005	2010	2015	2020	2025
Los Angeles County Urban Demand	1,777,000	1,886,000	1,917,000	1,977,000	2,023,000
Los Angeles County Conservation	268,000	330,000	369,000	400,000	437,000
Orange County Segment Urban Demand	129,000	134,000	138,000	144,000	150,000
Orange County Segment Conservation	17,000	21,000	23,000	25,000	27,000
Proportion of pre-1990 Conservation	120,000	120,000	120,000	120,000	120,000
Total Greater Los Angeles Region Demands	2,311,000	2,491,000	2,567,000	2,666,000	2,757,000
Metropolitan Total Demands	4,851,600	5,237,500	5,437,200	5,670,400	5,891,400
Region to Metropolitan Demand Ratio	48%	48%	47%	47%	47%

3.4.3 Water Supplies

The Region's available supply volume was determined similar to the demand. Metropolitan's IRP supply volumes are proportioned down according to the Region's population. These volumes were augmented with more specific agency information where available. The resulting available dry year supply for the Region is 2,512,000 acre-feet/year.

3.4.4 Gap

Projected demands are compared to the available supplies in Table 3-4 to determine the projected gap. As shown in the table, the projected gap in 2025 is estimated as 850,000 acre-feet/year. The table's projected demands represent a normal urban demand for the Region. It is anticipated that demands will increase with inclusion dry-year demand increases. Therefore, the projected gap of 850,000 acre-feet is considered a minimum value at this time and could increase through the planning effort.

Table 3-4. Region's Targets, Supplies, and Gap*			
Year	Projected Demand	Supplies	Gap
2005	--	2,512,000	--
2010	2,757,000	2,512,000	245,000
2015	3,043,000	2,512,000	531,000
2020	3,318,000	2,512,000	806,000
2025	3,360,000	2,512,000	850,000

**Numbers are rounded.*

4. WATER SUPPLY MANAGEMENT STRATEGIES

This Section summarizes current water supply management strategies, identifies areas for improvements, offers new strategies and suggests opportunities for integration with the other water resource management strategies. These strategies include:

1. Groundwater, Groundwater Management, and Conjunctive Use;
2. Recycled Water;
3. Ocean Desalination;
4. Existing Imported and Local Surface Water Supplies;
5. Surface Water Storage;
6. Water Transfers;
7. Conservation; and
8. Water Supply Reliability.

The further development of these strategies will help local water agencies overcome the supply gap identified in Section 3. Additional analysis completed for the development of these strategies is provided in Appendix B.

4.1 Groundwater, Groundwater Management, and Conjunctive Use

4.1.1 Background

Groundwater represents a significant portion of local supplies in the Region. Most groundwater basins in the Region are adjudicated. For the most part, historical production from these groundwater basins was greater than it is now and greater than the safe yield of individual basins. This production caused significant declines in groundwater basin levels, seawater intrusion, other water quality concerns, and the inability for some producers to continue producing from the basin without drilling deeper wells. As conditions deteriorated, and producers were not willing to settle on a compromise to protect the groundwater basin and reduce production, one of the appropriators in the basin would file a lawsuit against the other appropriators adjudicating the groundwater basin and seeking title to the water rights in the basin. Through engineering investigations, a safe yield is typically established by the court and rights to the safe yield are allocated to the parties in the lawsuit.

Raymond Basin was the first such adjudication in California. This adjudication was followed by several others in the area so that very few basins remain unadjudicated in the Region. A detailed discussion of the individual groundwater basins is presented in Appendix B.

4.1.2 Opportunities for Improvements and Integration

The following areas represent potential opportunities for optimizing the use of groundwater basins:

1. Basin managers could be provided authority to be able to prevent contamination of basin water quality. This would likely be more efficient than remediation in the future. A tax could be assessed on industry overlying each basin to pay for monitoring of discharges and groundwater basin quality in highly industrialized areas. As contaminants are found, the industry could be required to take action.

2. A "power pool" could be formed so that groundwater pumpers are able to obtain power at lower costs. Instead of a small retailer contracting with a large power supplier separately, a group of retailers contract with the power supplier obtaining further discounted rates. These producers may then be able to produce from areas in the basin that had previously been unproductive where the lift is high, and thus the cost of power, to produce the water currently prohibitive.
3. More facilities could be constructed to spread or inject both local and imported water when available.
4. Recycled water could be advance treated and used for augmenting groundwater storage.
5. A fund could be established by the State to provide research monies for groundwater modeling for further optimization of groundwater basins including pilot testing of treatment methods for constituents of concern. The application process should not be too cumbersome.

Opportunities for integration could come in several areas:

1. Stormwater quality treatment could be optimized to reduce contaminant contribution to groundwater.
2. Recharge facilities could be combined with other beneficial use components such as open space and habitat restoration. Should the open space be accessible to the public, careful planning would need to occur to ensure public safety (particularly during heavy storm flows) as well as water system security.
3. In addition to integrating with other water management areas, there may be inter-subregional opportunities for improvement for water supply. One suggestion would be to take advantage of facilities built by one agency by extending, enlarging or connecting another facility to the original facility. An example of this would include inter-basin transfer of recycled water. Institutional challenges such as the operation of the facility and cost-sharing would need to be addressed. This could be done by contract or forming a Joint Powers Authority (JPA). Legislation could be introduced which would make it less burdensome for the agencies to form a JPA. Again, there may be a role for the county where they administer the contract or operate the joint-use facilities.
4. Gravel pits could be considered for use as water supply reservoirs and stormwater capture facilities.
5. Recreational, open space, and habitat features could be incorporated in these facilities.

4.2 Recycled Water

4.2.1 Background

Recycled water is a key water supply strategy within the Region. Several agencies have been implementing recycled water strategies for many years to supplement other water sources. Examples of existing strategies are listed below:

- Expand recycled water system in the most economical way – The most economical way of expanding recycled water use vary by agency based on local opportunities and constraints. LACSD, for example approaches implementation in a five-phase strategy:
  - Phase 1 – Serve large recycled water users in the close vicinity of wastewater treatment plants.
  - Phase 2 – Develop City-focused distribution systems (e.g., City of Pomona, City of Long Beach).
  - Phase 3 – Develop regional distribution systems (e.g., City of Downey served through the Central Basin system).
  - Phase 4 – Merge regional systems as triggered by growth (e.g., connection of Lakewood system with Long Beach system, connection of Central and West Basin systems).
  - Phase 5 – Develop groundwater recharge and seawater intrusion projects (note that Phase 5 can be implemented at any time during the life of a recycled water program; it is not necessarily the last phase).

- Provide and pursue funding assistance – Through its Local Projects Program (LPP) and subsequently its Local Resources Program (LRP), Metropolitan has invested heavily to encourage water recycling in the planning area. Outside funding assistance has also been provided at the State and federal level (through the US Bureau of Reclamation, in particular). Water and wastewater agencies have actively pursued these programs to help move recycled water projects towards implementation.
- Develop regional partnerships – The Southern California Water Recycling Projects Initiative (Initiative), is an example of successful regional partnerships, and originated with the development of Southern California Comprehensive Water Reclamation and Reuse Study (SCCWRRS) and involves agencies beyond the planning area, has been involved in supporting recycled water projects since 2000. Examples of the main goals of the Initiative include: (1) assist local water and wastewater agencies in planning and addressing issues associated with the implementation of recycled water projects, (2) develop regional and single-agency recycled water project plans that maximize the potential for water recycling in Southern California, and (3) implement regional efforts to investigate and address emerging issues facing water recycling. Future opportunities for development of regional partnerships should be explored.

4.2.2 Opportunities for Improvements and Integration

The current recycled water annual average flows (including both tertiary and advanced treated water) total approximately 225 mgd, which represents approximately 25 percent of the current secondary treated effluent annual average flows (see Appendix B). Currently, 105 mgd is reused for municipal and industrial applications, environmental uses, groundwater replenishment, or seawater barrier. This represents approximately 45 percent of the available recycled water flows. The rest of the recycled water flows are discharged to the local streams, rivers, or directly into the ocean.

These numbers show the potential for expanding recycled water use within the planning area. However, there are a number of challenges to expanding recycled water use. One of the goals of the IRWMP is to identify pathways for integration that would help recycled water use expand. Potential pathways are discussed below:

- Regional integration. The focus of the SCCWRRS was to investigate the potential for regional integration. Four recycled water projects located within the planning area were identified in SCCWRRS as potential regional projects (i.e., several water and wastewater agencies needing to work cooperatively to produce and deliver recycled water): Calleguas/Las Virgenes, East San Gabriel, West Basin, and Central Basin.

  The remaining projects within the planning area (including Burbank, Los Angeles/Glendale, Long Beach, Alamitos, Long Beach Wetlands, Tillman/San Fernando Valley) were determined through SCCWRRS to be more economically beneficial as single-agency projects.
- Integration with other water management strategies. Three potential pathways for integration with other water management strategies are currently envisioned: (1) co-location of seasonal recycled water storage and flood control facilities, (2) use of recycled water facilities not operating during the winter months to treat stormwater, and (3) expansion of recycled water use for environmental restoration such as lake or wetland enhancement or creek restoration.

  During the continued development of the IRWMP, the potential application of these pathways through actual projects will be considered and the list of pathways will be refined and/or expanded. An example illustrating the integration with other water management strategies is a potential lake restoration project in the South Bay region. This project would use advanced treated recycled water from West Basin MWD's Carson Regional Treatment Plant to serve Harbor College for irrigation and Harbor Lake for recreational lake replenishment/enhancement.

4.3 Ocean Desalination

4.3.1 Background

Brackish water desalination has been in practice in the planning area for many years. The Central Basin MWD and the West Basin MWD operate brackish water desalters that produce significant water supply from local brackish groundwater. However, seawater desalination has not been an economic alternative to conventional sources of water supply until relatively recent improvements in high pressure reverse osmosis membrane technology that has lowered the operating pressure and, accordingly, the cost of producing potable water from seawater. These technological advances have spurred several water providers to closely examine the feasibility of desalinating seawater through pilot and demonstration scale testing.

4.3.2 Opportunities for Improvements and Integration

Desalination presents a unique opportunity to provide new supply on demand for it is relatively independent of hydrologic cycles. This flexibility could be integrated with a number of water supply strategies, as well as environmental and habitat strategies, to help resolve some of the Region's water issues. Potential improvements and integrations strategies to consider include:

- Using desalination supply to actively manage groundwater basin quality through conjunctive use or active injection.
- Supplementing surface and groundwater supplies throughout the year or hydrologic cycles as necessary to minimize reliability on imported water.
- Meeting environmental and habitat water needs during times of stress on the other water supplies.
- Researching technologies to reduce the use and thus the costs of energy for desalinating ocean water.
- Perform further research on membrane technology to improve salt removal and thus reduce the need for energy and drop costs.
- Consider efficiency of plant siting. For example, the close proximity of the LADWP and West Basin desalination plants could argue for consolidating the effort at one facility initially.

4.4 Existing Imported and Local Surface Water Supplies

4.4.1 Background

Los Angeles County and its surrounding areas are heavily dependent on local and imported surface water for drinking water supply. The primary sources of surface water supplies are SPW, Colorado River, and Mono and Owen Valley water through the Los Angeles Aqueduct. These three sources are essential for sustainable growth of the communities in this Region. Other surface water sources include local rivers: Los Angeles River and San Gabriel River, Malibu Creek, local sources (lakes, reservoirs), and surface water runoff collected to be used for additional supply sources. As demands for water increase throughout the Region, surface supply management must be re-evaluated to ascertain its optimum use.

4.4.2 Opportunities for Improvements and Integration

Developing and improving new local water sources can reduce the reliability of maintaining a high percentage of imported water in the supply portfolios of utilities in the Region. The following are some recommendations to improve and integrate the surface water supply scenarios for the Region:

- Seek and maintain a diversified water supply portfolio. Diversification should include creating opportunities to bring in new sources in the portfolio. Urban runoff management, conjunctive use, spreading basin and groundwater storage opportunities, etc., should be evaluated based on local availability and constraints.
- Develop community based educational and motivational strategies for conserving water for irrigation.
- Expand conjunctive use capability to capture excess surface water supplies. Also, where possible, consider naturalizing concrete-lined channels to increase percolation and reduce loss of water through evaporation.
- Improve the river water quality in Los Angeles River and San Gabriel River through ecosystem restoration and by controlling contamination from point and non-point sources. These rivers can provide additional reliability to the overall water resources portfolio in the Region.
- Strictly enforce water pollution prevention goals. This will improve water quality and reduce water treatment costs.
- Protect recharge areas, especially in spreading basins, and major watershed areas.
- Identify more recycled water use customers through education, public participation, and incentives. Recycled water is drought-proof, and supply increases with growth. Use of such reliable supply source will reduce dependence on other sources vulnerable to drought and competition among utilities.
- Seek opportunities for system re-operation. This includes probable modification of reservoir, canal and dam operations to better manage storm flows.
- Develop comprehensive urban runoff management programs at local levels to store and use stormwater as a resource.
- Leverage stormwater quantity/quality management for maximum supply yield.

4.5 Surface Water Storage

4.5.1 Background

A number of lakes and reservoirs have been in use by Metropolitan as part of its system to facilitate water delivery to various agencies (i.e. Diamond Valley Lake, Lake Skinner, Lake Mathews, and Silverwood Lake). Agencies also have constructed reservoirs to manage water supplies and operations. However, most of these local reservoirs are limited in their ability to capture local runoff. The exceptions are the reservoirs in the San Gabriel Mountains. There are opportunities to further develop these reservoirs as local surface water sources. Such efforts will reduce a utility's dependence on costly imported water, and will improve water system reliability.

4.5.2 Opportunities for Improvements and Integration

The following are some recommendations to integrate and improve the surface water storage for the Region:

- Seek opportunities for system re-operation. This includes probable modification of reservoir, canal, and dam operations to better manage storm flows.
- Seek ways to add surface storage to the Region for supply and other water management strategy benefits.
- Integrate gravel pits into storage and stormwater treatment strategies.
- Develop recreational opportunities with surface storage opportunities.
- Develop areas surrounding the lake or reservoir for habitat and to protect the water supply.

4.6 Water Transfers

4.6.1 Background

Until 1991, water transfers within the Region had been limited. Transfer of annual groundwater basin rights had been the norm and is a practice that continues. Additionally, agencies transfer water between themselves for operational flexibility. For example, Glendale transfers Metropolitan water to La Crescenta Water District, a Foothill MWD member agency. Metropolitan's transmission facilities have not been used to transfer local water from one agency to another mainly because of water quality issues and downstream impacts. Additionally, there is typically a restriction on exporting groundwater outside of the basin boundaries in most basin adjudications.

With the 1991 drought, the Governor's Water Bank was developed. Metropolitan along with other State Water Contractor's took advantage of that resource to augment supplies and lessen the severity of the impacts of the drought. Since that time, Metropolitan has participated in water transfers as a water management strategy to augment supplies. For example, in January 2003, fearing that it would be a dry-year, Metropolitan purchased options for water transfers from several Sacramento Valley water districts which it later exercised. After accounting for Delta conveyance losses of about 20 percent, the effective unit cost for the water was about $125 per acre-foot.

The City of Los Angeles plans on developing water transfers as part of its supply strategy rather than purchasing water from Metropolitan during dry years. Should costs be lower than purchasing Metropolitan water, other agencies would be interested in such a supply strategy.

4.6.2 Opportunities for Improvements and Integration

Water transfers provide a high degree of flexibility and are a valuable tool necessary to implement many of the integrated water strategies developed in this IRWMP. One of the primary restrictions to increasing transfers within the Region is the limitations on using Metropolitan facilities because of water quality impacts to downstream users. Once these water quality impacts are mitigated, opportunities for transfers and thus more water supply reliability can be attained.

A water supply transfer that is being completed through direct replenishment has opportunities for integration with other water management strategies where the areas around the recharge basins are developed for habitat or other beneficial uses.

4.7 Conservation

4.7.1 Background

Water conservation is a key strategy in water supply within the Region. The strong reliance on imported water and the inherent variability in this supply has spurred efforts throughout the Region to minimize the use of water where possible through water efficiency. Conservation is an important element for emergency and drought planning as well as an ongoing strategy to ensure long term availability of supplies in the face of population growth.

Water conservation generally falls under two categories – active and code based. Active conservation comes from programs offering proactive best management practice support such as rebates, device installation, and plumbing retrofits. Active conservation can be directly influenced by water agencies. Code based conservation is created through ordinances that require either certain water conservation actions or penalize water wasting.

4.7.2 Opportunities for Improvements and Integration

Integrating conservation strategies requires identifying methods to improve conservation results. The potential for improvement and integration methods, which will be refined through the course of the IRWMP based on actual potential projects, are discussed below:

- Emphasize landscape irrigation conservation. Landscape irrigation is one of the areas that offer significant opportunities for further conservation within the planning area. The recent efforts of the AB2717 Landscape Task Force provided a list of opportunities for further conservation in landscaping. The recommendations from the Task Force report can be incorporate into regional programs. When designing landscape irrigation projects, efforts should first be made to target areas that are beyond the reach of recycled water projects. Increased coordination between the City and County parks representatives with water agencies will help to establish region-wide conservation programs.
- Develop improved methods to measure conservation. Another opportunity lies in developing better ways to monitor water savings from conservation. This would allow water conservation projects to be more performance-based and would enable Regional targets to be set and progress measured. The ability to conduct cost-benefit analysis would be improved. It would also help promote water conservation by allowing water agencies, developers, businesses, and institutions to receive credit for their contributions.
- Consider stakeholder suggested actions. Other ideas for water conservation brought up during stakeholder workshops included assessing fines for runoff and providing public recognition for water conservation. Another opportunity lies in changing the Covenants, Conditions and Restrictions (CCR) restrictions in many homeowner agencies that restrict the ability to utilize native or water friendly landscaping. A goal for water conservation could be tied directly to the Region's share of imported water. Grey water use was also discussed. A final opportunity identified was to develop programs to make information about landscape conservation more accessible.
- Develop conservation master plans. The development of conservation master plans is the first step in integrating conservation efforts regionally.
- Implement pilot programs. A pilot program could be developed to demonstrate the efficiency of large landscape irrigation devices and to draw interest from potential partners. Training and installation can be consolidated on a sub-regional basis. Since there are micro zones that exist throughout the Region, a comprehensive installation and potential sharing of data would allow creation of a locally improved system. Since the weather-based irrigation controllers will also reduce dry weather urban runoff, the large landscape irrigation programs can be combined with and be counted as part of urban runoff reduction efforts.

4.8 Water Supply Reliability

4.8.1 Background

The Region has been actively pursuing water supply reliability since the early 1900s. The City of Los Angeles was the first to recognize supply limits and constructed the Los Angeles Aqueduct. As demands increased, the City of Los Angeles, along with other agencies, came together to form Metropolitan to import water from the Colorado River, followed by the SWP.

As a result of the 1987-1992 drought, Metropolitan and its member agencies recognized that they must actively pursue further supply development to improve reliability. Metropolitan embarked on an Integrated Resources Planning (IRP) effort in 1994. This effort resulted in goals for a mix of both local and imported supplies to 2020. In 2003, this plan was updated with projected 2025 goals for the supply mix (discussed in Section 3).

As part of the original IRP process, a drought management plan was adopted. This plan known as the Water Surplus and Drought Management (WSDM) Plan provides a sequencing of water resource management actions that would be taken under both surplus and shortage conditions. A matrix of these actions can be seen in Figure 4-1 below.

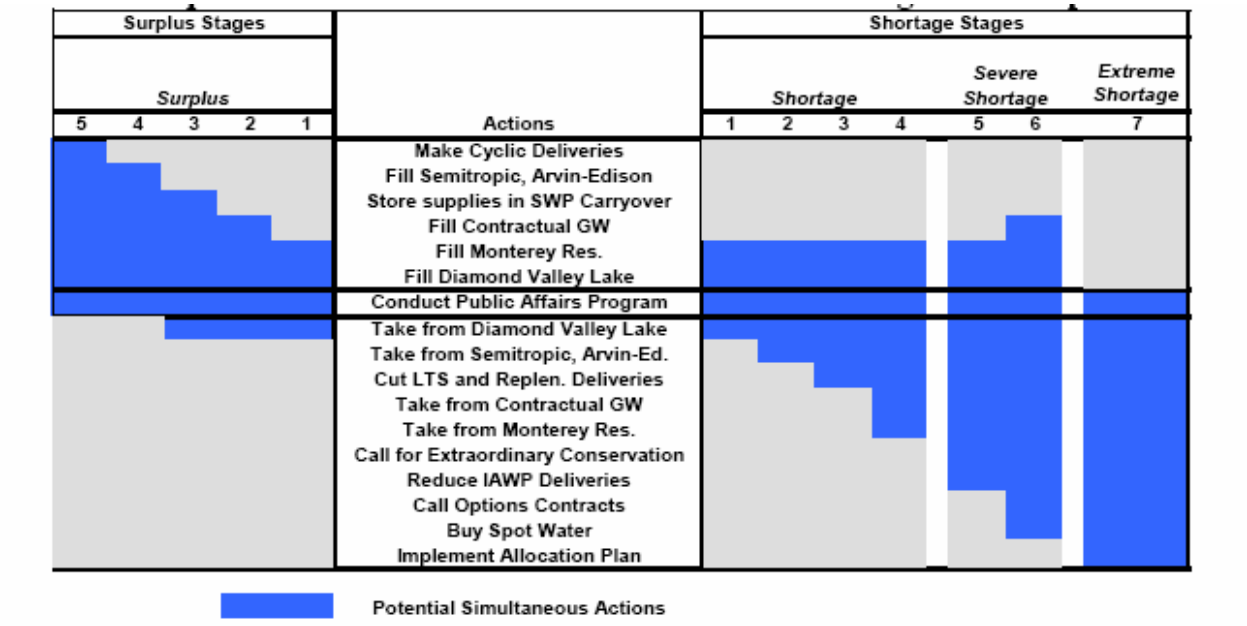


Figure 4-1. WSDM Matrix

This matrix acts as a "framework" and actions can be taken out of sequence. The goal is to use the different actions to avoid implementing the last action, an allocation plan. The matrix is read from the center of the "Actions" column to the right or left. If Metropolitan is in a surplus stage, it would be read from the center up and to the left. If Metropolitan is in shortage stages, it would be read from the center down and to the right. Metropolitan's General Manager has authority to act on all surplus stages and shortage stages 1 through 4. Metropolitan's Board must approve stages 5 through 7.

In addition to Metropolitan's efforts, many agencies in the Region have water shortage contingency plans for up to a 50 percent shortage as addressed in their respective UWMPs.

4.8.2 Opportunities for Improvements and Integration

Much of Metropolitan's IRP strategy to improve reliability through diversifying the supply mix depends on the development of local supplies. The following lists strategies and concepts to improve the supply reliability by developing local supplies:

- Increase education efforts to inform the public of reliability supply issues and potential consequences of low reliability supplies.
- Further develop drought response supplies such as desalination and proactive groundwater banking.
- Funding from the State to help defray some of the costs of developing supplies.
- Streamlining and removing roadblocks from the permitting process for new projects.
- Stakeholder groups working together to overcome institutional complexities and water quality challenges.
- Further research to develop new technologies to overcome barriers to projects.

Integrating these strategies and concepts with the various supply and demand management strategies will enhance the viability of all the integration efforts.

4.9 Example Integrated Strategies

Through the course of this project, specific projects have already been identified that exemplify integrated strategies and will be further evaluated for prioritization and implementation planning. Additional integrated projects will also be developed and analyzed to further integrate water supply projects with water quality, habitat, open space, and recreational values.

Current and potential integrated projects include:

- Flood control re-operations can be evaluated to increase water capture from storm events through existing flood control facilities. This can benefit both water supply and water quality.
- Gravel pits can be considered for integrated capture of stormwater, replenishment of imported water supplies into groundwater basins and development of recreational values. The pits are private property and many are commercial enterprises. Significant constraints exist.
- Additional spreading basin capacity could be developed that has recreational and habitat benefits. There is a significant shortage of spreading capacity in the Region.
- Recycled water can be highly treated and piped to areas to return high quality water to achieve year round stream flows and augment water supplies. This would meet water quality objectives and assist in meeting supply objectives. Recreation, open space and habitat values could be incorporated. Recycled water irrigation could be expanded to provide additional recreational and habitat values.
- Stormwater management strategies can be optimized to increase water infiltration. Distribution and design of stormwater detention facilities could augment groundwater supplies in certain parts of the Region.
- All waterways could be developed with hiking, biking and open space features.
- Brownfield sites adjacent to water features could be rehabilitated with water/recreational features.

5. CONCLUSION

The Region has been involved in developing water supplies and improving supply reliability for over 100 years. As demand has increased, and available supplies have been allocated, the Region increasingly faces a gap between supply and demand. Combining recent studies and investigations by agencies within the Region indicates a minimum urban water demand gap of 850,000 acre-feet/year for a single dry year event by the year 2025.

The Region's agencies have been focusing on improving water supply reliability and adding new supply. Many water supply projects, although perceived as only benefiting water supply, also benefit the other water management strategies. However, because most water supply projects are typically developed by a water supply agency and its charge is only over water supplies, typically the other benefits are underemphasized. For example, any project that promotes conservation also provides a benefit to water quality by decreasing urban runoff. The same is true for recycled water. Although not a direct benefit to the Region, any project that either reduces demand or increases local supplies during any year helps the Bay-Delta estuary.

Recent efforts have involved partnering and integration strategies to help meet many of the competing water supply issues. Developing a Region IRWMP will expand and increase these efforts to provide the greatest benefit to the Region. Existing water supply strategies and new potential strategies considered in this IRWMP versus their respective integration with the IRWMP objectives are summarized in Table 5-1. The development of the IRWMP objectives, other than water supply, are presented in the other two TM's.

Table 5-1. Water Supply Strategies and Integration with IRWMP Objectives							
IRWMP Objective	Groundwater, Management, and Conjunctive Use	Recycled Water	Desalination	Surface Water	Water Transfers	Conservation	Supply Reliability
Sustain current local water resources production capacity and quality and provide a minimum 850,000 acre-feet/year of additional water supply and/or demand reduction.	X	X	X	X	X	X	X
Reuse or infiltrate a minimum of 700,000 acre-feet/year of additional reclaimed water (or 630 mgd) (over and above the 120,000 acre-feet/year or 105 mgd of recycle currently occurring). This corresponds to a total goal of 80 percent recycle of the available reclaimed wastewater and would require adding tertiary treatment for about 510 mgd (over and above the 225 mgd currently).	X	X					X
Reduce, capture, infiltrate and/or treat the 50th to 90th percentile dry weather urban runoff flow, approximately 250 to 450 cubic feet per second (cfs), or 180,000 to 320,000 acre-feet/year.	X	X		X		X	
To reduce, capture, infiltrate and/or treat 70th to 85th percentile storm event, approximately 17,000-26,000 acre-feet/year of stormwater runoff from developed areas.	X			X			X
Recycle 50-80 percent annual stormwater runoff from urban areas, 300,000-500,000 acre-feet/year.	X	X		X			X
Restore 20 linear miles of riparian habitat and associated buffer in Santa Monica Mountains.	X	X	X	X	X	X	X
Provide an additional of 30,000 acres of watershed-friendly parkland and open space, focused on under-served communities.	X	X	X	X	X	X	X

6. LIMITATIONS

Report Limitations

This document was prepared solely for the Leadership Committee of Greater Los Angeles County Integrated Regional Water Management Plan in accordance with professional standards at the time the services were performed and in accordance with the contract between the Leadership Committee of Greater Los Angeles County Integrated Regional Water Management Plan and Brown and Caldwell dated May 15, 2006. This document is governed by the specific scope of work authorized by the Leadership Committee of Greater Los Angeles County Integrated Regional Water Management Plan; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by the Leadership Committee of Greater Los Angeles County Integrated Regional Water Management Plan and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

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APPENDIX A

Water, Wastewater and Other Service Entities

WATER, WASTEWATER AND OTHER SERVICE ENTITIES

This appendix provides basic information on each water and wastewater agency within the planning area. It also provides a brief description of regional water supply facilities. In total 35 institutions that provide water or wastewater services or manage groundwater resources are described in this section. Although this may seem extensive, it does not cover all of the agencies that provide service in the area. For example, we only describe Metropolitan's member agencies. Some of those Metropolitan member agencies then wholesale water to over 100 other entities that then provide water to retail customers. Those other entities are not described in this Section. Additionally, it does not cover other institutions that provide regulatory oversight over water or wastewater services, such as the California DHS, RWQCBs, or the U.S. Environmental Protection Agency.

Regional Agencies

There are two agencies that provide imported water supplies to the region. These are the Metropolitan and San Gabriel Valley MWD. Both agencies import water and distribute to their own member agencies, and neither provides water to retail customers. Metropolitan imports water from both the SWP and the Colorado River, while San Gabriel Valley MWD imports water from only the SWP. Below is a description of both agencies.

Metropolitan

Agency Description: Metropolitan was incorporated in 1928 with the primary purpose of delivering Colorado River water to the coastal southern California area. As demands increased, Metropolitan became a SWP contractor and also began importing water from northern California.

Population: The entire service area population is approximately 18,233,800 in 2005 and is projected to increase to 21,367,500 in 2025. The Region population is estimated to be 9,990,555 in 2005 and grow to 11,275,348 in 2025.

Service Area: Metropolitan's service area covers the southern California coastal plain and includes portions of Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura Counties. Of the 38,155 square mile total for the six counties, 5,178 square miles are in the Metropolitan service area. Metropolitan's service area is approximately 4,076 square miles.

Water Demand: Metropolitan is the supplemental supplier of water to 26 agencies within its service area. It provides water for municipal and industrial, replenishment and agricultural purposes. Total retail demands with conservation within its service area were 4,115,700 acre-feet in 2005 and are projected to increase to 4,784,600 acre-feet by 2025. Total retail demands with conservation within the Region were approximately 1,908,476 acre-feet in 2005 and projected to increase to 2,184,163 acre-feet by 2025.

There can be dramatic swings in Metropolitan member agency demands based on rainfall and available local supplies. For example, in calendar year 1990 deliveries were at an all time high of about 2.6 million acre-feet. By calendar year 1998, deliveries had dropped to about 1.4 million acre-feet. However, in calendar year 2004, deliveries were back up to about 2.5 million acre-feet. Deliveries are now tracking at about 2.3 million acre-feet for this calendar year. In 2025, imported water demands in Metropolitan's service area are projected to be 2.3 million acre-feet for an average year. For a single dry year, 2025 demands are projected to be 2.36 million acre-feet.

Water Resources/Supply: As mentioned previously, water supplies in Metropolitan's service area come from both local and imported sources. Metropolitan imports supplies from the Colorado River and SWP. Additionally, the LADWP imports water from Owens Valley and Mono Basin. The San Diego County Water Authority has also recently begun importing Colorado River water as a result of the Quantification Settlement Agreement.

Local supplies include groundwater, surface water and recycled water. Additionally, ocean desalination is being developed by some agencies as a future new source of local water. Conservation and water use efficiencies are implemented to decrease demands and to augment these supplies.

Metropolitan provides supplies to meet approximately 50 percent of the total demands on average within its service area. Depending on its member agencies mix of supplies, Metropolitan may provide potable supplies of anywhere from between 0 percent (City of San Fernando in some years) to almost 100 percent (Las Virgenes MWD).

Based on projected demands and on Metropolitan's goal to be 100 percent reliable, Metropolitan embarked on an IRP effort in 1994. This effort resulted in goals for a mix of both local and imported supplies to 2020. In 2003, this plan was updated with projected 2005 goals for the supply mix. The Update also included an added supply buffer to hedge against potential shortfalls in local supply development or loss of supplies. This supply mix includes conservation as an element in meeting reliability.

Water Quality: Metropolitan delivers both treated and untreated water to its member agencies. The untreated water may be for replenishment and agricultural purposes or it may be delivered to an agency that treats it and then delivers it for potable use. Metropolitan also has five potable water treatment plants that process water before delivery to its member agencies. Metropolitan has begun enhancing these conventional treatment plants with ozonation treatment. This enhancement will be completed in 2011.

Both sources of Metropolitan's imported water present water quality challenges. Colorado River water contains elevated total dissolved solids (TDS), as well as uranium and perchlorate. For the SWP, concerns are total organic carbon, bromide and chloride concentrations (still below standards or notification levels). Metropolitan has found that, through increased efforts such as source water protection, blending, and developing water management programs, water quality concerns can be managed.

San Gabriel Valley MWD

Agency Description: San Gabriel Valley MWD was formed in 1959 to meet the supplemental water needs of its member agencies. These agencies are the Cities of Alhambra, Azusa, Monterey Park and Sierra Madre, all located in the San Gabriel Valley. San Gabriel Valley MWD has one pipeline with five turnouts that it uses for recharge purposes.

Population: The service area population is estimated to be 217,000 in 2005 and projected to increase to 255,000 by 2025.

Service Area: The District's service area covers a total of 27.2 square miles. However, this service area is spread out throughout San Gabriel Valley, since the member agencies are not all adjacent to each other.

Water Demand: San Gabriel Valley MWD currently delivers only replenishment water to its agencies to make up for production in excess of their annual pumping rights. Pumping rights are based on the safe yield of the basin, which is established annually by the Main San Gabriel Basin Watermaster. Based on an average operating safe yield in the basin of 200,000 acre-feet, San Gabriel Valley MWD expects to deliver about 12,000 acre-feet of supplemental supplies in fiscal year 2004-05 and projects to deliver 18,200 acre-feet of supplemental supplies in fiscal year 2024-25. Should the operating safe yield drop to 140,000 acre-feet, it expects to increase deliveries to about 24,500 acre-feet in fiscal year 2024-25.

Water Resources/Supply: San Gabriel Valley MWD's service area has both imported and local supplies. San Gabriel Valley MWD's sole source of water is imported water from the SWP. This water is not supplied directly to its member agencies. Rather, it is delivered as replenishment water for both the Main San Gabriel and Central groundwater basins. These replenishment deliveries are used to cover production in excess of Main San Gabriel Basin water rights by San Gabriel Valley MWD's member agencies as well as provide the District's portion of the Long Beach Judgment Make-up Water. Additionally, its member agencies have groundwater rights in the Main San Gabriel Basin. Conservation and water use efficiency measures are used to reduce demands and offset the need for increasing imported supplies.

San Gabriel Valley MWD is considering extending its pipeline to the Raymond Basin to meet the needs of the City of Sierra Madre, one of its member agencies which overlies only that basin. The City has over-extracted its rights to the Basin and is currently exchanging water with the City of Arcadia to meet its requirements.

In 1991, an amendment to the Main San Gabriel Judgment was passed allowing the use of up to 30,000 acre-feet of recycled water in the Basin. A demonstration project in conjunction with Main San Gabriel Basin Watermaster and Upper San Gabriel Valley MWD is proposed which would recharge up to 10,000 acre-feet of tertiary treated wastewater in the Basin using the San Gabriel River for the recharge. If San Gabriel Valley MWD participates in the construction of the project, its share of the recharged recycled water would be about 1,600 acre-feet on average. Other uses of recycled water are being studied

Water Quality: As noted previously, San Gabriel Valley MWD provides untreated State Project water for recharge purposes. This water meets all state and federal standards for groundwater recharge use. However, the groundwater in the Main San Gabriel Basin contains volatile organic chemicals (VOCs) and is the subject of Superfund sites for clean up of the Basin.

Metropolitan Member Agencies

As mentioned above, Metropolitan has 26 member agencies. Each member agency varies in size, amount of water deliveries, and mix of water supplies. The paragraphs below briefly describe each agency in the Region. Although some of Metropolitan's member agencies wholesale to cities within their service area, we have not reviewed those cities' water supply information.

City of Beverly Hills

Population: The 2005 population was 35,564. The population in 2025 is expected to grow to 46,768.

Service Area: The City of Beverly Hills' city limits include 5.69 square miles and are bounded by Trousdale Estates, by San Vicente Boulevard on the east and by Whitworth Drive on the south. The City also provides water utility service to a portion of the City of West Hollywood that is bounded on the west by Doheny Drive, on the north by Sunset Boulevard, on the east by Flores Street and on the south by Beverly Boulevard.

Agency Type: The City became a charter member of Metropolitan on December 29, 1928. The City depends on Metropolitan for 90 percent of its water supplies. In order to avoid complete dependency on imported water (and the continued rising costs of those supplies), the City started redeveloping its groundwater supplies in the 1990s.

Water Demand: Historic and projected water demand trends lines show that the overall water consumption in the City has decreased while the population has increased. This indicates that water conservation has been achieved. Future water demands will continue to be met by obtaining purchases from Metropolitan and extracting from local wells. Demands in 2005 were 13,280 acre-feet. Demands in 2025 are projected to be 14,426 acre-feet.

Water Resources/Supply: The City's imported water supply is delivered through two connections on Metropolitan's Santa Monica Feeder System. Each connection has a capacity of 40 cubic feet per second (cfs), which together are capable of delivering up to 46,336 acre-feet/year of water into the City's system at 80 percent operational capacity. The City's groundwater supplies are pumped from four groundwater wells, all of which require treatment at the Public Works Facility. The City's reverse osmosis treatment plant has a capacity of 3 million gallons per day (mgd) and treats all groundwater. This plant supplies the City with approximately 10 percent of its annual water supply requirement. The City's water distribution system is gravity-based and consists of thirteen separate pressure zones, two of which supply a portion of the City of West Hollywood. The City maintains a total of 10 reservoirs which have a combined total capacity of 44.2 million gallons. Its water system also includes two emergency interconnections with the water system of the LADWP. The City is currently pursuing a third emergency connection to improve fire safety on a closed pressure system.

Water Quality: The issue of water quality is important not only in the use of current water, but also in the development of new sources. The extracted local groundwater is treated at the City's water treatment plant to meet current standards. Groundwater quality concerns include TDS and hydrogen sulfide. Additionally, high methane levels have been detected in one of its wells.

City of Burbank

Population: The City of Burbank's 2005 population was 106,739. A population of 121,348 is projected in 2025.

Service Area: Burbank encompasses about 17 square miles. Burbank is located in the southeast corner of the San Fernando Valley.

Agency Type: Burbank is one of the original 13 cities that formed Metropolitan. In addition to imported water by Metropolitan, Burbank supplies local groundwater and various blended forms of groundwater and imported water to its customers.

Water Demand: Total water demand within Burbank's service area includes potable water demand and groundwater replenishment. Current average annual potable water demand of about 22,500 acre-feet is projected to increase to 26,160 acre-feet by 2025. Projected replenishment demand will increase from 1,800 acre-feet in 2005 to 6,900 acre-feet in 2025. Demand for recycled water used in power plants, parks, and parking lots will increase from 1,100 acre-feet in 2005 to 3,100 acre-feet in 2025.

Water resources/supply: The 2005 water supply portfolio for potable water included 71 percent (16,000 acre-feet) treated water imported by Metropolitan and 29 percent (6,500 acre-feet) groundwater. All of its replenishment water was imported untreated water from Metropolitan.

The City of Burbank has planned to create a balanced water resources mix for potable use. It is projected, that by 2025, the resources mix on average will reduce imported water use and increase local groundwater use. The water portfolio for 2025 includes 52 percent (13,660 acre-feet) imported water and 48 percent (26,160 acre-feet) groundwater.

The City produces disinfected tertiary effluent in the Burbank Water Reclamation Plant (BWRP). The effluent is high quality recycled water and is being used in the power plants for cooling and for landscape irrigation. The City is currently developing a recycled water master plan to build a future recycled water distribution system.

The City of Burbank is also aggressively implementing BMPs. Demand management techniques used in the BMPs are helping the City to live within its supply limits and water budgets.

Water Quality: Burbank has two water treatment plants to remove VOCs from groundwater. More recently, the inorganic substances nitrate and hexavalent chromium have presented problems. The Lake Street Granular Activated Carbon (GAC) plant has been shut down since March 2001 because of hexavalent chromium in the groundwater. Burbank is currently supporting research on chromium removal technology with its neighboring agencies. New chromium regulations are expected to be issued in 2006. Production capacity can be available from City wells 7 and 15 if the chromium concentration can be maintained below the Maximum Contaminant Level (MCL) using the processes at the Lake Street GAC Plant. These wells combined could then yield between 200 and 250 acre-feet per month.

Calleguas MWD

Although a portion of Calleguas appears to be in the Region, all of Calleguas has been incorporated into the Ventura County IRWMP. Thus, it is not addressed in this technical memorandum.

Central Basin MWD

Population: The Central Basin MWD population was 1,614,400 in 2005 and is projected to increase to 1,821,200 in 2025.

Service Area: Central Basin MWD encompasses approximately 227 square miles in southeast Los Angeles County.

Agency Type: Central Basin MWD is a water wholesaler and does not provide any direct retail services. It wholesales water to 24 cities, mutual water companies, investor-owned utilities, water districts, and private companies in the region. In addition to the potable water, Central Basin MWD supplies recycled water to its member agencies for municipal, commercial, and industrial use.

Water Demand: Total water demand within Central Basin MWD's service area includes retail demand and groundwater replenishment. Replenishment includes deliveries to the Rio Hondo and San Gabriel River spreading grounds in the Montebello Forebay. Central Basin MWD service area's current average annual retail demands of about 252,799 acre-feet are projected to increase to 295,059 acre-feet by 2025. Projected replenishment demand will slightly shift from 77,758 acre-feet in 2005 to 77,600 acre-feet in 2010 and will remain constant through 2025.

Water resources/supply: The 2005 water supply portfolio for retail water included 24 percent (61,033 acre-feet) imported water from Metropolitan, 74 percent (186,549 acre-feet) groundwater, and 2 percent (5,217 acre-feet) reclaimed water.

Central Basin MWD has been delivering three different types of imported water to its member agencies: Non-Interruptible Water (treated full service), Seasonal Treated Replenishment Water, and Seasonal Untreated Replenishment Water. Non-Interruptible Water (NIW) is the treated firm potable supply that is guaranteed for the year. Central Basin MWD delivers an average of 63,000 acre-feet NIW annually. Seasonal Treated Replenishment Water is delivered to customer agencies that are eligible to offset groundwater production with imported water which indirectly replenishes groundwater basin. Seasonal Untreated Replenishment Water is delivered to the spreading basins for direct groundwater replenishment.

Groundwater is the primary source of supply for Central Basin MWD's service area, and will remain so through 2025. The basins contributing to the supply includes Central Basin (79 percent of available groundwater supply) and Main San Gabriel Basin (21 percent of available groundwater supply).

Central Basin MWD is also using recycled water to augment local supplies and to reduce dependence on imported water. The District is planning to double its recycled water use by 2010.

Central Basin MWD plans to create a balanced water resources mix for retail use during the next 20 years with the expansion of the District's reclaimed water system, increased conservation efforts, and groundwater storage/replenishment opportunities. It is projected that by 2025, the resources mix on average will include 25 percent (74,409 acre-feet) imported water, 69 percent (202,000 acre-feet) groundwater, and 6 percent (16,650 acre-feet) reclaimed water. A 16 percent demand savings is targeted through demand management and water conservation.

Central Basin MWD has partnered with the Water Replenishment District of Southern California (WRD) to maintain adequate supply for groundwater replenishment. Replenishment is done to improve basin storage and to maintain a hydraulic barrier against saltwater intrusion into the basin. The replenishment water sources includes imported water from Metropolitan (27,600 acre-feet) and reclaimed water from local sources (50,000 acre-feet).

Water Quality: Central Basin MWD has few water quality challenges as a wholesaler of water from Metropolitan. For groundwater quality, Central Basin MWD assists its member agencies in meeting drinking water standards through its Cooperative Basin-Wide Title 22 Groundwater Monitoring Program. Central Basin MWD is regularly monitoring for MTBE in the groundwater supply of its member agencies. To date, no MTBE has been detected. Central Basin MWD is participating in the San Gabriel Basin Restoration Fund to construct perchlorate treatment facilities throughout the San Gabriel Valley to remove contaminants and restore the groundwater basin.

City of Compton

Population: The City's population in 2005 was 97,137 and is projected to grow to 107,597 by 2025.

Service Area: The City of Compton is located at the geographic center of Los Angeles County, and has a gross area of 10.5 square miles of which the Compton Water Department (CWD) serves 7.81 square miles. The remaining areas are served by private water companies.

Agency Type: The City of Compton's water supply needs are carried out by the CWD. The CWD is an urban water supplier as defined by Water Code section 10617. It regulates and controls the use, sale, and distribution of water owned and controlled by all within its service area boundary.

Water Demand: Current average annual potable water demand of about 10,207 acre-feet is projected to increase to 11,306 acre-feet by 2025.

Water resources/supply: The 2005 water supply portfolio included 56 percent (5,723 acre-feet) local groundwater and 44 percent (4,484 acre-feet) imported water by Metropolitan. The projected water portfolio for 2025 includes 49 percent (5,723 acre-feet) groundwater, and 51 percent (11,306 acre-feet) imported water.

Water Quality: The City of Compton receives treated water from Metropolitan, and only chlorinates its groundwater.

Foothill MWD

Population: Foothill MWD's 2005 population was 84,000. The population is expected to increase to 94,482 by 2025.

Service Area: Foothill MWD's service area encompasses approximately 22 square miles.

Agency Type: Foothill MWD is a water wholesaler and does not provide any direct retail services. Eight retailing agencies are members of Foothill MWD.

Water Demand: Foothill MWD service area's current average annual demands are about 19,800 acre-feet (not including replenishment) and are projected to increase to 24,400 acre-feet by 2025.

Water Resources/Supply: Foothill MWD has one treated water connection to Metropolitan's Upper Feeder from which it takes the majority of its imported water. Foothill MWD's member agencies produce groundwater and most use a mix of groundwater and imported water to meet demands. Use of imported water has increased from less than 20 percent in the early years of Foothill MWD's formation to the current level of 60 percent (5-year average). Currently about 7,500 acre-feet of groundwater and 120 acre-feet of recycled water deliveries are used to meet demands. The balance of demands is met through imported water.

The cost of developing more recycled water compared to imported water makes it a prohibitive supply option for Foothill MWD. Foothill MWD has implemented all BMPs for conservation that it can as a water wholesaler, and it participates in other Metropolitan conservation programs. Foothill MWD is participating in a conjunctive use project where it will store 9,000 acre-feet of water in the Raymond Basin for extraction when needed. A maximum of 3,000 acre-feet may be extracted annually. It is also considering an extension of the San Gabriel Valley pipeline into its service area, which would bring 100 percent State Project water into its service area. This pipeline would allow Foothill MWD to meet demands for one of its retail agencies and possibly spread water into the Raymond Basin.

Water Quality: Foothill MWD has few water quality challenges as a wholesaler of water from Metropolitan. Foothill MWD's sub-agencies, however, are managing nitrate, perchlorate, VOCs, high levels of fluoride and radiation in local groundwater sources.

City of Fullerton

Population: Fullerton's 2005 population was approximately 135,000. It is expected to increase to 143,000 by 2025.

Service Area: The 22.3 square-mile service area and City boundaries are contiguous. The Water Utility was formed in 1906, and today has 430 miles of transmission and distribution mains, 16 reservoirs (89.5 million gallons-combined capacity), 12 pumping stations, and 12 wells (11 active).

Agency Type: The City of Fullerton is one of Metropolitan's original member agencies. It is fully dependent on Metropolitan and the Orange County Water District (OCWD) for long-term water supplies. All of the City's water supply planning relates to policies, rules, and regulations of these two wholesalers.

Water Demand: The key factors that have an effect on water demands in Fullerton are climatic, demographic and economic. Water consumption within the Fullerton service area can be categorized into five customer classes: residential, commercial, industrial, municipal, and agricultural. It is expected that the percentage of total sales for all classes, except residential and industrial will remain about the same from 2005-2030. Demands in 2005 were 31,501 acre-feet and are projected to slightly decrease to 30,868 acre-feet by 2025.

Water Resources/Supply: The City provides a mix of Metropolitan imported water and groundwater to meet retail demands. OCWD establishes the amount agencies overlying the Orange County basin may produce annually. Fullerton produces that amount and buys the balance of its needs from Metropolitan.

Water Quality: The City of Fullerton's water supply meets all drinking water standards. Fullerton's groundwater and imported water supplies have experienced high levels of TDS as a result of high mineral and inorganic salt levels. Future water supply projects include the drilling of two new pilot wells in an effort to produce non-potable water for irrigation.

Glendale

Population: The 2005 population of Glendale was 196,435 and is projected to grow to 211,000 by 2025. A small part of Glendale is served by the Crescenta Valley Water District (CVWD). CVWD is a member of the Foothill MWD and serves about 8,000 citizens in Glendale. This area is excluded from Glendale's population figures.

Service Area: The City encompasses about 31 square miles and is located north of the City of Los Angeles, and between Burbank and Pasadena. The City currently has 31,063 water customers.

Agency Type: The City of Glendale is a founding member agency of Metropolitan. The City is an urban water supplier as defined by Water Code section 10617. It conducts its water business through the Glendale Water and Power Department (GWP) which is an enterprise organization. GWP regulates and controls the use, sale, and distribution of water owned and controlled by all within its service area boundary.

Water Demand: The City's current service area has an average annual demand of about 32,638 acre-feet. Projected 2025 demand is 38,600 acre-feet.

Water Resources/Supply: The Glendale potable water system receives its water from two basic sources: local groundwater from the San Fernando and Verdugo Basins, and imported water from Metropolitan. The 2005 water supply portfolio includes 69 percent (22,666 acre-feet) imported water, 27 percent (8,674 acre-feet) groundwater, and 4 percent (1,298 acre-feet) recycled water.

The City has been working diligently to reduce its use of imported water. The City reduced the amount it produces from groundwater basins from about 17,000 acre-feet/year to about 12,000 acre-feet/year in the mid 1970s because of the San Fernando Judgment. Then, from the early 1980s to the late 1990s, the City had to rely even more on imported water from Metropolitan because of water quality issues in the San Fernando Basin and Verdugo Basin. After Glendale constructed the Glendale Operable Unit (GOU) consisting of a water treatment plant and 8 new wells in the summer of 2000, the use of San Fernando Basin groundwater was restored. The City is also expanding its use of recycled water to reduce its dependence on imported water. Glendale is actively incorporating the BMPs per the 1990 California Urban Water Agencies/Environmental Interests MOU to conserve water and manage demand.

Water Quality: Trace levels of trichloroethylene (TCE), perchloroethylene (PCE), and other VOCs were detected in the San Fernando Basin during the early 1980s. These VOCs are industrial solvents and degreasers used by industries in the region for decades. Data collected at that time indicated that the concentrations of TCE and PCE were at the MCLs at all the wells. As a result, the City had to stop producing water from those wells. EPA designated the basin as a Superfund Site that prompted the construction of the GOU, which restored the use of groundwater from the San Fernando Basin. Achieving the goal of reducing VOC levels increased the hexavalent chromium concentration in the treated water from the GOU. There is no MCL for hexavalent chromium. The Federal National Toxicology Program is currently conducting studies to determine the health effects of hexavalent chromium in water. The City is working with EPA and AwwaRF to conduct bench-scale and pilot-scale studies to identify hexavalent chromium remedial processes. Depending on the legislation defining an MCL and research results in finding environmentally and economically feasible technology to remove it, the City may have to construct a treatment facility to keep the groundwater resources available in the water supply portfolio.

Las Virgenes MWD

Population: Las Virgenes MWD's 2005 population was 71,175 and is expected to increase to 85,675 by 2025.

Service Area: The Las Virgenes MWD service area is nearly 75,000 acres in the Santa Monica Mountains.

Agency Type: Las Virgenes MWD provides potable water to its service area through wholesale purchases from Metropolitan. Las Virgenes MWD also provides recycled water to its service area from the Tapia Water Reclamation Facility (TWRF), which is jointly owned and operated by Las Virgenes MWD and Triunfo Sanitation District (TSD).

Water Demand: Las Virgenes MWD has recently completed an Integrated Master Plan for the Potable Water System for Las Virgenes MWD and Recycled Water System for the Joint Venture of Las Virgenes MWD and TSD (Master Plan). The Master Plan identifies a number of projects that would assist Las Virgenes MWD in meeting future demands. Some projects identified would improve Las Virgenes MWD's water supply reliability while others are replacement and improvement projects. The Master Plan also discusses how potable water is used to supplement the recycled water system to meet peak demands.

Water Resources/Supply: Las Virgenes MWD has four sources of supply:

1. Imported treated, potable water from Metropolitan,
2. Recycled water from the Tapia Water Recycling Facility (TWRF),
3. Groundwater from the Russell Valley Basin (currently used only to supplement the recycled water system), and
4. Surface water runoff to the Las Virgenes Reservoir.

Las Virgenes MWD has very limited natural water resources. Almost all of its potable water is provided by Metropolitan. Las Virgenes MWD also receives approximately 150 acre-feet/year of treated water from the City of Simi Valley and the Ventura County Waterworks District. However, Las Virgenes MWD has developed and integrated its water resources to provide recycled water for increased reliability and conservation. This has included the aggressive use of recycled water, some use of groundwater to augment recycled water supplies, and storing water during non-peak hours for use during peak demands.

Water Quality: Groundwater underlying Las Virgenes MWD's service area is of poor quality and is not currently used for the potable water supply system. However, it is used to augment recycled water supplies.

Because Las Virgenes MWD receives the majority of its potable water supply from Metropolitan, water quality challenges include Total Organic Carbon in SWP water. Other water quality challenges include MTBE in local surface reservoirs and NDMA in recycled water. There are several programs in place that aim to address water quality concerns related to SWP supplies.

City of Long Beach

Population: The City of Long Beach's 2005 population was 490,000. It is projected to grow to 551,000 by 2025.

Service Area: Long Beach Water Department's (LBWD) service area is approximately 100 square miles.

Agency Type: The City of Long Beach's water needs are provided through the LBWD. The City is one of the original 13 cities that formed Metropolitan. LBWD is an urban water supplier as defined by Water Code section 10617 and regulates and controls the use, sale, and distribution of water owned and controlled by the City of Long Beach.

Water Demand: LBWD's service area current average annual municipal and industrial demands are about 75,104 acre-feet. This demand is projected to increase to 85,600 acre-feet by 2025. LBWD has been maintaining a seawater barrier in southeast Long Beach for several decades. This barrier prevents seawater

from intruding into the fresh-water aquifer. Water supplies needed to maintain this barrier will reduce from 5,197 acre-feet in 2005 to 4,200 acre-feet in 2010, and will remain constant thereafter.

Water Resources/Supply: Approximately half of the potable water served by the LBWD is purchased from Metropolitan; the balance is water pumped from the local groundwater basin and reclaimed water. The 2005 water supply portfolio includes 58 percent (43,939 acre-feet) imported water from Metropolitan, 35 percent (25,955 acre-feet) groundwater, and 7 percent (5,210 acre-feet) reclaimed water. A 14 percent reduction in demand was achieved through water conservation. The breakdown for water used to maintain the seawater barrier in 2005 included 4,672 acre-feet of imported water and 525 acre-feet of reclaimed water.

The cost of imported water is approximately double the cost of groundwater. The cost of reclaimed water is high in the initial years because of the high capital cost of installing the infrastructure, but LBWD is trying to offset this high initial cost through State and federal funding. LBWD will increase its use of reclaimed water as it is available to replace imported water in the future. LBWD is also using aggressive techniques for water conservation throughout its service area and is expecting to conserve more than 21,000 acre-feet of water per year by 2030, an amount projected to equal 29 percent of potable water demand at that time. A very promising source of future water supply for the LBWD is desalinated seawater. LBWD is currently partnering with U.S. Bureau of Reclamation and the LADWP to construct and operate the largest seawater desalination research facility in the country. The research is expected to be completed by 2007. LBWD will commit to this reliable water supply if it proves to be technically, economically, and environmentally feasible. The projected water portfolio for 2025 includes 30,488 acre-feet of imported water, 32,684 acre-feet of groundwater from LBWD's Central Basin Aquifer rights, 12,428 acre-feet of recycled water, and 10,000 acre-feet of desalinated seawater.

LBWD has formed a partnership with WRD, and with partial funding from the U.S. Bureau of Reclamation, has constructed a facility to polish reclaimed water. The treated water from this polishing facility will be injected into the seawater barrier and will gradually replace the need for imported water to maintain the barrier. The projected 2025 need for the seawater barrier is 4,200 acre-feet, and the goal is to use polished reclaimed water to meet all of the replenishment demand.

Water Quality: LBWD is not expecting any change in water quality from its supply sources (Metropolitan, groundwater, reclaimed water). The available and projected water resources are not dependent on water quality limitations.

City of Los Angeles

Population: The City of Los Angeles' population in 2005 was 3,955,429. It is projected to grow to 4,270,520 by 2025.

Service Area: The service area encompasses approximately 464 square miles.

Agency Type: TheLADWP has been meeting the water supply needs of the City of Los Angeles for over a century. LADWP is the largest municipally-owned utility in the United States. LADWP is an urban water supplier as defined by Water Code Section 10617 and regulates and controls the use, sale, and distribution of water owned and controlled by the City of Los Angeles. LADWP is one of the founding members of Metropolitan.

Water Demand: LADWP's service area 2005 average annual demands were about 661,000 acre-feet and are projected to increase to 755,000 acre-feet by 2025. The City has been aggressively following BMPs to manage demand through water conservation techniques. Historically, the City has achieved a water conservation goal of 15 percent demand reduction. The City's current plan is to attain a 20 percent reduction in demand by 2025.

Water Resources/Supply: LADWP's primary water sources include surface water runoff from the eastern Sierra Nevada via the Los Angeles Aqueducts, Colorado River Water imported by Metropolitan via the Colorado River Aqueduct, and SWP deliveries from the San Joaquin and Sacramento River Delta in Northern California via the California Aqueduct. These three sources make up 85 percent of the City's average annual water supply. The remaining 15 percent total potable water supply is local groundwater. Groundwater use can go up to 30 percent during drought years. LADWP will seek water transfer arrangements with other agencies in an effort to replace Los Angeles Aqueduct water that has been committed for environmental restoration in the Owens Valley and to further improve reliability of the City's water supply.

LADWP is currently researching desalination of seawater. It is one of the pioneering utilities that are actively supporting and funding research in desalination. LADWP is involved in a high profiled joint venture research project on seawater desalination with LBWD and U.S. Bureau of Reclamation in Long Beach, California and partnered with West Basin MWD and AwwaRF in another seawater desalination research project in El Segundo, California. If desalination of seawater proves economically and environmentally feasible, LADWP may develop a fully operational seawater desalination facility at the Scattergood Generating Station by the year 2015.

Another potential resource includes capturing urban runoff, which can be treated and recycled to reduce demand. LADWP is also considering reuse of gray water or untreated household wastewater which has not come in contact with toilet waste as another source of reuse water for landscape irrigation.

The 2005 normal year water supply portfolio included 276,000 acre-feet of water from the Los Angeles Aqueduct, 106,000 acre-feet of groundwater, and 1,950 acre-feet of reclaimed water. Remaining supplies were purchased from Metropolitan, with some production from recycled water.

The projected water portfolio for 2025 includes 276,000 acre-feet of water from the Los Angeles Aqueduct, 106,000 acre-feet of groundwater, 26,950 acre-feet of recycled water, 13,500 acre-feet of desalinated seawater, 40,000 acre-feet of transfer water, and the remaining 292,550 acre-feet from Metropolitan.

Water Quality: Water delivered by the Los Angeles Aqueduct is generally the highest quality supply source available to the City. Snowmelt from the eastern Sierra Nevada contains low total organic carbon (TOC) and bromide concentrations, constituents that can form disinfectant byproducts during the water treatment process. One constituent in Los Angeles Aqueduct water that is present in greater than background concentration is arsenic. While the average arsenic concentration within LADWP's water distribution system of 5 parts per billion is well below the current federal and State drinking water standard, LADWP is taking a proactive approach in addressing this issue in light of potential, more stringent arsenic regulations. LADWP is evaluating enhanced coagulation at the Los Angeles Aqueduct Filtration Plant as a means of addressing future water quality regulations faced by LADWP, including arsenic. A pilot project using enhanced coagulation will be performed. If successful, enhanced coagulation may be a part of the treatment process at the Los Angeles Aqueduct Filtration Plant by 2015.

LADWP is transitioning to chloramines for disinfection to recover operational flexibility due to the loss of in-city reservoir storage (as a result of the Surface Water Treatment Rule). This transition, which is expected to be completed by 2008, will allow LADWP to maintain the same high level of disinfection in its water supply while freeing itself from other potential disinfection issues associated with the use of chlorine as a disinfectant. The use of chloramines will also allow chemical disinfection for compatibility in cases where the City must purchase and blend Metropolitan water (which is chloraminated) with other sources of supply in the distribution system.

As part of its regulatory compliance efforts, LADWP works with the DHS to perform water quality testing of production wells in the San Fernando Basin (SFB). Trace levels of the contaminants trichloroethylene (TCE), perchloroethylene (PCE), and other VOCs have been detected in the SFB. The presence of these

contaminants is due to improper chemical disposal practices done in the past by numerous companies in the San Fernando Valley that were using such materials.

In the 1990s, detectable amounts of hexavalent chromium and perchlorate were found in various wells within the SFB. During this period, increasing nitrate levels have also been found in the SFB. LADWP has established operating goals for TCE, PCE, hexavalent chromium, perchlorate, and nitrates that are more stringent than the MCLs permitted by federal or State regulations. These stricter operational limits provide an additional safety margin from these contaminants for City customers. The table below summarizes these water quality goals and compares them with the State-regulated requirements, which are generally more stringent than federal requirements.

The numerous groundwater management efforts and remediation that LADWP undertakes has resulted in all SFB groundwater delivered to customers that meets or exceeds water quality regulations. LADWP will be undertaking a comprehensive groundwater study for the SFB that will review current and future contaminants of concern. Results from the study may lead to enhanced treatment of groundwater supplies.

LADWP purchases both treated and untreated water from Metropolitan. Typically, purchased water that emanates from the Colorado River has higher total dissolved solids concentrations, while water originating from the SWP typically has higher concentrations of bromide and total organic carbons. LADWP coordinates with Metropolitan and its member agencies in managing these constituents in Metropolitan's water supplies. As with LADWP's water quality improvement program, this is an on-going effort that will require substantial future investments in water treatment.

Finally, LADWP performs approximately 200,000 tests annually to ensure that water quality in its water distribution system meets or exceeds regulatory standards.

Municipal Water District of Orange County

Population: Municipal Water District of Orange County (MWDOC) has more than 2.3 million residents. Within the GLACO region, it is estimated that the population is 565,555. It is expected that MWDOC's population will grow to 2,650,000 by 2025 and the population encompassing the Region will grow to 699,548 by 2025.

Service Area: MWDOC encompasses more than 600 square miles. Of that, the Region overlaps about 84 square miles.

Agency Type: MWDOC provides wholesale imported water from Metropolitan to 30 Orange County cities and water agencies that then provide retail water service. MWDOC also coordinates and sponsors regional water conservation programs in cooperation with its local retail agencies and engages in regional water resource and reliability planning in cooperation with other local and regional water, wastewater, and groundwater management agencies.

Water Demand: MWDOC water demands in the Region are currently approximately 137,000 acre-feet and are projected to increase to 149,859 acre-feet by 2025.

Water Resources/Supply: MWDOC's service area water supplies come from both local and imported water supplies. Local supplies are developed by individual member agencies, are primarily groundwater, and account for about 50 percent of MWDOC's direct use. The remaining 50 percent of direct water use demand is met by imported water from Metropolitan.

The Orange County groundwater basin underlies north and central Orange County, and provides approximately 66 percent of the water needed in the area. Currently, groundwater is produced from approximately 500 active wells within the Basin, approximately 300 of which produce less than 25 acre-

feet/year. Groundwater production from approximately 200 large capacity or large system wells operated by the 21 largest water retail agencies account for an estimated 97 percent of total production.

Programs are currently in place which aim to strengthen water supply reliability and to meet future demands. OCWD is currently constructing a recycled water plant called the Groundwater Replenishment System (GWR System). When completed in 2007-08, it is expected to deliver 72,000 acre-feet/year of recycled water supply to meet the demands for replenishment and saltwater barriers. Another program looks to capturing Santa Ana River flows for stream recharge. It is estimated that municipal discharge will increase from 145,000 acre-feet/year at present to 190,000 acre-feet/year by 2025.

Recycled water is widely accepted as a water supply source throughout MWDOC's service area. It is expected that groundwater recharge will soon surpass landscape irrigation as the greatest customer of recycled water in Orange County.

There are seven groundwater recovery projects within MWDOC's service area that produced a combined yield of 18,632 acre-feet in fiscal year 2004-2005. This supply is expected to increase to 32,380 acre-feet at the ultimate development of these projects.

MWDOC is evaluating ocean desalination. Currently there are three proposed projects that could serve MWDOC and its member agencies with additional water supplies.

- Poseidon Resources Corporation Proposed Project-Currently in environmental review. At this time, there are no agreements with water agencies in Orange County for purchase of the product water.
- Joint San Diego/Orange County Proposed Regional San Onofre Project-Currently being investigated to determine project feasibility. This project has a 2020 implementation timeframe according to the San Diego County Water Authority.
- MWDOC Proposed Dana Point Ocean Desalination Project- Currently investigating the feasibility of an ocean water desalination plant in Dana Point adjacent to the San Juan Creek. Upon completion of the feasibility study, a report will be prepared and a decision to proceed or not will be made. MWDOC has received a Proposition 50 Research and Development Grant in the amount of $1,000,000 to investigate this project further.

There are many other planned water supply projects/programs within MWDOC's service area. These include groundwater wells, desalters, treatment plant upgrades, and reclamation of wastewater.

Water Quality: Current quality issues are seawater intrusion near the coast, colored water from natural organic materials in the lower aquifer system, TDS, nitrate and localized VOC contamination.

City of Pasadena

Population: In 2005, the total population within the service area was approximately 167,000. This population is expected to increase to 193,223 by 2025. The Pasadena Water and Power Department (PWP) serves these 167,000 persons through 37,500 service connections.

Service Area: The City of Pasadena covers nearly 23 square miles and is located in Los Angeles County and within the northwestern portion of the San Gabriel Valley. It is bounded to the west by the cities of Los Angeles and Glendale, on the south by cities of South Pasadena and San Marino, on the east by the cities of Arcadia and Sierra Madre, and on the north by the unincorporated community of Altadena and by the San Gabriel Mountains. Water is served to customers within the City of Pasadena, unincorporated areas outside the city, and water that is primarily used for municipal purposes. Approximately 15 percent of PWP's customers live outside the City limit.

Agency Type: The City of Pasadena is a municipal water supplier, providing retail water to its customers, within the City of Pasadena and unincorporated areas outside the City. It is one of the founding member agencies of Metropolitan.

Water Demand: Water use within PWP's service area is two-thirds residential and one-third commercial/industrial. Currently, the City identifies customers by address and meter size. However, a disadvantage in this method is that the City is unable to distinguish an industrial customer from a large landscape customer or hotel. PWP is taking steps to remedy this to gather a better understanding about the system and to better define demand profile. Demands in 2005 were 35,902 acre-feet and are projected to increase to 43,959 acre-feet by 2025. Normalized annual production to meet demands is approximately 38,000 acre-feet.

Water Resources/Supply: PWP's water is obtained from three sources: surface water, local groundwater derived from the Raymond Basin (40 percent), and imported water (60 percent), purchased from Metropolitan. For groundwater production, PWP owns and operates 17 wells. Currently, there are 27 interconnections with neighboring water agencies to enhance the reliability of the water system and for use in case of emergency. The water distribution system consists of 500 miles of various sizes of pipeline ranging from 2 inches to 42 inches in diameter, 20 booster stations, 23 pressure zones, and 22 storage reservoirs with a total capacity of 110 million gallons. PWP has five connections to Metropolitan's distribution system. The Raymond Basin, which underlies the City of Pasadena, is the most important local resource. It is an adjudicated groundwater basin and Pasadena has annual production rights of about 30,000 acre-feet/year on average.

Water Quality: Water from the Colorado River Aqueduct generally contains high levels of salinity. Metropolitan is actively encouraging its member agencies to develop local storage options to help mitigate the effect of a period of high salinity.

In the Raymond Basin, groundwater quality has been impacted by a variety of chemical contaminants, including VOCs, perchlorate, nitrate, and arsenic. VOCs occur in a number of wells in an isolated area in the northwest region of the basin. Perchlorate has had the largest impact on water quality in the Raymond Basin in recent years and has required the removal of 8 of Pasadena's 17 wells from service.

Water quality can adversely affect water management by reducing available supplies and reliability. PWP is aggressively pursuing groundwater contamination treatment solutions that will help avoid any long term effects on its water supply.

Another critical component of PWP's future water management plans is the Raymond Basin Conjunctive Use Program (RBCUP). PWP is moving forward in reviewing plans for the RBCUP, which is a conjunctive use partnership with Metropolitan and Foothill MWD. This is an important program that would provide direct benefits to PWP as well as regional benefits in the event of a drought.

A recycled water program is another method currently being explored by PWP via feasibility studies to potentially replace potentially inconsistent water supplies.

City of San Fernando

Population: The City of San Fernando's 2005 population was 25,607. It is projected to be 26,883 in 2025.

Service Area: The service area is approximately 2.42 square miles, is located in the northeasterly portion of the San Fernando Valley in Los Angeles County, and is surrounded by the City of Los Angeles.

Agency Type: The City of San Fernando is a member agency of Metropolitan. The City is an urban water supplier as defined by Water Code Section 10617, and regulates and controls the use, sale, and distribution of water owned and controlled by all within the City boundary.

Water Demand: The City's current service area has an average annual demand of about 3,962 acre-feet. Projected 2025 demand is 3,766 acre-feet using a 2 percent reduction through water conservation.

Water Resources/Supply: The City of San Fernando operates its own water utility. The water provided is a blend of imported water from Metropolitan and local groundwater. The 2005 water supply portfolio includes 80 percent (3,255 acre-feet) groundwater and only 20 percent (800 acre-feet) imported water. Water purchased from Metropolitan is intended to supplement local groundwater beyond entitlement, and to allow the City to build up water credit in the Sylmar Basin.

The City's imported water needs are expected to remain constant throughout the years. The projected 2025 water portfolio includes 3,500 acre-feet of groundwater, and 800 acre-feet of imported water. The slight increase in demand will be compensated by the water conservation measures.

Water Quality: Groundwater quality in the City is good.

City of San Marino

Population: The City of San Marino's 2005 population was 13,631. The projected 2025 population is 14,000.

Service Area: California American Water Company provides water service to the City of San Marino through its Los Angeles District. The San Marino Service area lies 10 miles northeast of downtown Los Angeles in the San Gabriel Valley.

Agency Type: The City of San Marino is one of the original Metropolitan member agencies.

Water Demand: Water demands in 2005 were 4,388 acre-feet and are projected to be 4,903 acre-feet by 2025.

Water Resources/Supply: The City is primarily dependent on its groundwater resources. Groundwater is supplied to area customers from wells sunk into the Main San Gabriel and Raymond groundwater basins. The City purchases imported surface water from Metropolitan to meet its remaining demands.

Water Quality: Water quality for groundwater within the City is good.

City of Santa Monica

Population: Santa Monica's population was 88,500 in 2005. It is projected to grow to 91,200 by 2025.

Service Area: The service area is 8.3 square miles (approximately) on the west side of Los Angeles County. It is bordered on three sides by the City of Los Angeles and the Pacific Ocean on the west.

Agency Type: The City of Santa Monica is a founding member agency of Metropolitan. The City is an urban water supplier as defined by Water Code Section 10617, and regulates and controls the use, sale, and distribution of water owned and controlled by all within the City boundary.

Water Demand: The City's current service area has an average annual demand of about 14,635 acre-feet. Projected 2025 demand is 17,831 acre-feet with a 20 percent reduction through water conservation.

Water Resources/Supply: The City of Santa Monica operates its own water utility. The water provided is a blend of imported water from Metropolitan, recycled water, and local groundwater. The current water supply

portfolio (2005) includes 88 percent (13,196 acre-feet) imported water, 10 percent (1,406 acre-feet) groundwater, and 2 percent (336 acre-feet) recycled water.

The City is now taking deliveries of Metropolitan water at two locations: Arcadia WTP and Charnock Well Field and Pump Station site. Before 1993, the City produced more than 10,000 acre-feet of groundwater annually. In 1995, MTBE was detected in its well system and the City had to stop producing from 5 of its wells in the Charnock Well Field and take remedial actions to remove MTBE. Because 5 of the wells were shut down, groundwater production was reduced significantly. The City expects to complete construction of an MTBE treatment plant by 2010. The City will then be able to implement a new groundwater management plan. As that occurs, the City is expecting to increase its groundwater use which will eventually help the City to reduce its use of imported water.

The City's recycled water supply comes from the Santa Monica Urban Runoff Recycling Facility built in 2002. The facility treats urban runoff and sends treated water for use in parks, streets, Woodlawn Cemetery, and dual plumbed buildings.

The projected water portfolio for 2025 includes 4,006 acre-feet of imported water, 10,036 acre-feet of groundwater, and 560 acre-feet of recycled water.

The City of Santa Monica has adopted a Sustainable City Plan which includes goals to use an aggressive water conservation program to reduce overall water use by 20 percent by 2010, and increase the percentage of locally-obtained potable water to 70 percent by 2010.

Water Quality: The City of Santa Monica detected MTBE in its Charnock groundwater supplies and had to stop production from that basin. An MTBE treatment facility will be constructed by 2010. Once the treatment facility is on-line, the City can start using the shut-down wells again.

Three Valleys MWD

Population: The current population is estimated at 550,000. The population in 2025 is expected to grow to 754,644.

Service Area: Three Valleys Municipal Water District (TVMWD) incorporates the areas of the eastern San Gabriel Valley, Pomona Valley, and Walnut Valley. TVMWD has contiguous boundaries with five different municipal water districts, four of which are also member agencies of Metropolitan. The District's boundaries encompass approximately 133.3 square miles. There are seven general divisions that comprise the TVMWD.

Agency Type: TVMWD is a wholesale provider of water to its member agencies. Its member agencies, in turn, either retail water directly to their customers, or wholesale it to other public agencies and private water companies for resale. Most of TVMWD's member agencies have some local supply available to them, however when water demands exceed these local supplies, the member agencies rely on TVMWD to supplement their needs.

Water Demand: The primary use of TVMWD's supplemental water supplies is for domestic and municipal purposes. In 2005, demands were 130,100 acre-feet. In 2025 demands are projected to be 158,001 acre-feet.

Water Resources/Supply: The water utilized within TVMWD's service area is comprised of local and imported supplies. Local sources have historically met about 45 percent of the water needs in the service area, while TVMWD's imported supplies have met the remaining 55 percent needs. Additionally, TVMWD is active in conservation and water recycling.

Water Quality: There are several groundwater basins that underlie the Three Valleys service area. Some of these basins have poor groundwater quality that limits the availability to produce significant supply. TVMWD has implemented several groundwater conjunctive use and cleanup projects (i.e. Live Oak Basin

Conjunctive Use Project, San Antonio Spreading Grounds Conjunctive Use Project, and Chino Basin Conjunctive Use Project). Water quality concerns for Three Valleys include the following:

- Perchlorate in Colorado River and local groundwater supplies
- Disinfection by-products formed by disinfectants reacting with bromide and total organic carbon (TOC) in State Project water
- MTBE in groundwater and local surface water reservoirs
- Nitrate in groundwater supplies
- VOCs in the groundwater supply
- NDMA in groundwater and treated surface waters
- Hexavalent chromium in groundwater
- Radon in groundwater

City of Torrance

Population: The 2005 service area population for the City of Torrance was 100,100 and is projected to increase to 119,100 in 2025.

Service Area: Water service to a major portion of the City of Torrance is provided by the Torrance Municipal Water Department (TMWD). It provides water services to about 78 percent of the land within City of Torrance boundary which comprises of approximately 16 square miles. The remaining areas of the City are served by California Water Services Company which is a member of the West Basin Municipal Water District.

Agency Type: Torrance is a member agency of Metropolitan. The City is an urban water supplier as defined by Water Code Section 10617, and regulates and controls the use, sale, and distribution of water owned and controlled by all within the Department's service area boundary.

Water Demand: TMWD's current service area has an average annual demand of about 30,070 acre-feet (2005). Projected 2025 demand is 31,580 acre-feet.

Water Resources/Supply: TMWD currently receives approximately 65 percent of its supply from Metropolitan and 35 percent from local sources. The 2005 water supply portfolio includes 19,370 acre-feet (65 percent) imported water, 1,114 acre-feet (4 percent) groundwater, 2,542 acre-feet (8 percent) from a groundwater desalter project, and 7,044 acre-feet (23 percent) recycled water.

The City takes deliveries of Metropolitan treated water through five connections. Since Metropolitan water is more expensive than water from local sources, the City is looking for options to reduce the use of imported water.

The City has a groundwater right of 5,640 acre-feet from the West Coast Groundwater Basin, but the City's ability to extract groundwater is limited due to water quality issues. TMWD is investigating ways to make full use of its groundwater rights. Currently, because it is not using all of its water right allocation, TMWD can lease its water rights to other purveyors. In fiscal year 2003-04, TMWD leased 450 acre-feet of its groundwater rights to the Roman Catholic Archdiocese of Los Angeles.

TMWD purchases recycled water from West Basin MWD through Water Recycling Project. It is also under contract with WRD to purchase water from the Goldsworthy Groundwater Desalter Project.

The projected water portfolio for 2025 includes 20,440 acre-feet of imported water, 5,640 acre-feet of groundwater, 2,400 acre-feet of desalter project water, and 7,250 acre-feet of recycled water.

Water Quality: TMWD gets treated water from Metropolitan. Metropolitan is responsible for the imported water quality. The West Basin MWD is currently coordinating groundwater quality compliance monitoring of wells for TMWD. Organics have rendered two of TMWD's wells unusable. TMWD is currently in the process of arranging funding for a nanofiltration water treatment plant to treat unusable groundwater.

Upper San Gabriel Municipal Water District

Population: The combined 2005 population served was 898,000. The projected population for 2025 is 1,069,000.

Service Area: Upper San Gabriel Municipal Water District (Upper District) is located within San Gabriel Valley in Los Angeles County and overlies the Main San Gabriel Groundwater Basin. Upper District's service area is about 144 square miles and includes all portions of the Cities of Arcadia, Baldwin Park, Bradbury, Covina, Duarte, El Monte, Glendora, Industry, Irwindale, La Puente, Monrovia, Rosemead, San Gabriel, South El Monte, South Pasadena, Temple City, and West Covina. Portions of Azusa are also served by Upper District.

Agency Type: Upper District is a wholesale water agency that was incorporated on January 7, 1960, under the Municipal Water District legislative authority. Upper District is governed by a five-member Board of Directors and is broken down into five divisions. As a wholesaler, Upper District supplies supplemental imported water from Metropolitan and recycled water to its sub-agencies. While Upper District is a water wholesaler with no retail customers of its own, Upper District's sub-agencies provide water to retail customers. Upper District's sub-agencies include a number of urban water providers.

Water Demand: Upper District depends upon Metropolitan for its current and future imported water supplies. The reliability of future supplies of imported water is directly dependent upon the sources available to Metropolitan. Upper District works with local agencies to use recycled water, which is obtained from the Sanitation Districts of Los Angeles County (LACSD).

Water Resources/Supply: Upper District's sub-agencies produce water from the Main San Gabriel Basin, Upper District does not. Upper District provides imported water through Metropolitan's distribution system and recycled water is distributed via a local system. The majority of the imported water delivered from Upper District to its sub-agencies is used for groundwater recharge.

The Whittier Narrows Water Reclamation Plant (WNWRP) and the San Jose Creek Water Reclamation Plant (SJCWRP) are operated by LACSD. The SJCWRP provides wastewater service to a population of approximately 1 million people. During fiscal year 2003-04, the total water production from this plant was 92,000 acre-feet. The WNWRP serves a population of 150,000 and had a total water production of 8,380 acre-feet. These two facilities provide a source of recycled water for Upper District's existing and proposed recycled water projects.

The Upper District is involved in the following programs: Groundwater Recharge Program, San Gabriel Valley Water Recycling Direct Reuse Projects, and the Desalinated Water Project.

Water Quality: The water supply to Upper District's sub-agencies meets all State and federal water quality standards. Water produced from the Main Basin has historically been impacted by VOCs, nitrate, MTBE, perchlorate, NDMA, arsenic, radon, and chromium. Upper District and its sub-agencies have treatment facilities to treat the contaminated groundwater to meet drinking water standards.

West Basin MWD

Population: West Basin Municipal Water District's (West Basin MWD) 2005 population was 852,800. The projected population is 964,600 by 2025.

Service Area: The service area encompasses 185 square miles in Los Angeles County.

Agency Type: West Basin MWD is a water wholesaler and does not provide supplies to meet any direct retail demands. It wholesales water to 17 cities, mutual water companies, investor-owned utilities, water districts, and private companies in the region. West Basin MWD is a member of Metropolitan from which it purchases potable water. In addition to the potable water, West Basin MWD supplies recycled water to its member agencies for municipal, commercial, and industrial use.

Water Demand: The total water demand within the West Basin MWD's service area includes retail demand and groundwater replenishment. Retail demand is defined as all municipal and industrial uses, and represents the population's total direct water consumption. Replenishment includes deliveries to the saline barriers (West Coast and Dominguez Gap Barriers). West Basin MWD service area's current average annual retail demands is about 183,916 acre-feet. The demand is projected to increase to 212,140 acre-feet by 2025. Projected replenishment demand will increase from 22,500 acre-feet in 2005 to 27,500 acre-feet in 2025. The West Basin MWD has achieved 7 percent demand reduction through conservation in 2005. A 14 percent – 16 percent demand reduction is anticipated to be achieved through water conservation by 2025.

Water Resources/Supply: The 2005 water supply portfolio for retail water included 70 percent (129,215 acre-feet) imported water from Metropolitan, 23 percent (41,535 acre-feet) groundwater, and 7 percent (13,065 acre-feet) reclaimed water. A 7 percent demand reduction has been achieved through water conservation.

West Basin MWD has partnered with other national and local water agencies in conducting pilot studies to desalinate ocean water for potable water use. The research looks very promising, and West Basin MWD is projecting to generate up to 20,000 acre-feet of desalinated ocean water in 2012. West Basin MWD has planned to create a balanced water resources mix for retail use during the next 20 years with the expansion of the District's reclaimed water system, increased conservation efforts, groundwater storage/ replenishment opportunities, and desalinated sea water. It is projected that by 2025, the resources mix on average will include 47 percent (100,140 acre-feet) imported water, 25 percent (52,000 acre-feet) groundwater, 19 percent (40,000 acre-feet) reclaimed water, and 9 percent (20,000 acre-feet) ocean desalinated water.

The replenishment water sources include imported water from Metropolitan and reclaimed water from West Basin MWD. The current portfolio for replenishment water includes 15,000 acre-feet of imported water and 7,500 acre-feet of reclaimed water. The projected portfolio for 2025 includes 10,000 acre-feet of imported water and 17,500 acre-feet of reclaimed water.

Water Quality: Metropolitan is responsible for complying with State and Federal drinking water regulations on its imported water sold to West Basin MWD. West Basin MWD's retail customer agencies are responsible for ensuring compliance in their individual distribution systems. For groundwater quality, West Basin MWD assists its member agencies in meeting drinking water standards through its Cooperative Basin-Wide Title 22 Groundwater Monitoring Program. West Basin is working with the Water Replenishment District (WRD) to remove VOCs at some of the well facilities.

San Gabriel Valley MWD Member Agencies

City of Alhambra

Population: The current population for the City of Alhambra is about 87,000. The projected 2025 population is 109,164.

Service Area: The City of Alhambra is contiguous with the cities of South Pasadena and San Marino on the north, San Gabriel on the east and Monterey Park on the south. The City occupies an area of 7.68 square miles and is situated eight miles east of the City of Los Angeles within the San Gabriel Valley.

Agency Type: The City is a local water purveyor that sells retail customers within its service area.

Water Demand: The historic domestic water demand during non-drought years was approximately 130 gallons per person per day use (gpcd). Currently, the gpcd is 126, based on the 2004 metered sales and current population. The City of Alhambra maintains records of water usage and service connections by customer group. The categories are broken down as follows: single family residential, multi-family, commercial/industrial/institutional, landscape irrigation, and other. The total annual water consumption for 2004 was about 12,729 acre-feet. Projected demands in 2025 are 15,858 acre-feet.

Water Resources/Supply: The City has a legal right to pump groundwater from both the Main Basin and the Raymond Basin, and can purchase imported water from Metropolitan through an agreement with Upper District.

Currently, the City pumps groundwater only from the Main San Gabriel Basin because its well located within the Raymond Basin is inactive. The City has a total of 8 active wells and 3 inactive wells. The City also has six reservoirs, five booster pump stations, and one Metropolitan connection.

The City's major source of water supply comes from its 8 active wells, located within the Main Basin. These wells pump into the southern zone after treatment or blending. The City's wells are located in a portion of the Main Basin that does not benefit from the replenishment and recharging efforts of the Main San Gabriel Basin Watermaster.

The City also receives Metropolitan imported water supplies through an agreement called the Cooperative Water Exchange Agreement (CWEA). In 2004-05, the City pumped 9,784.72 acre-feet of groundwater and received 2,998 acre-feet of imported water from Metropolitan. The City also has three interconnections in case of an emergency. If Metropolitan's water supply becomes interrupted, the City can receive assistance from California-American Water Company and San Gabriel Valley MWD.

Water Quality: The Main San Gabriel Basin Watermaster was created to help restore groundwater quality and resolve water issues that have risen among water users in the San Gabriel Valley. VOCs are the contaminants of concern in groundwater sources, due to disposal by local industries. Nitrate has also infiltrated into local groundwater supplies as a result of agricultural operations.

City of Azusa

Population: The current population of the City of Azusa is 105,000. The projected 2025 population is 116,250.

Service Area: Azusa Light and Water (ALW) serves an area of approximately 10,613 acres in size located within the San Gabriel Valley. The City of Azusa occupies 40 percent of ALW's service area. ALW's service area also includes portions of the Cities of West Covina, Covina, Irwindale, Glendora, and some unincorporated areas of Los Angeles County.

The San Gabriel Valley is bounded on the north by the San Gabriel Mountains, on the west by the San Rafael and Merced Hills, on the south by the Puente Hills and the San Jose Hills, and on the east by the San Gabriel River System and the Upper Santa Ana River System.

ALW's service area is primarily a residential community. Approximately 92 percent are single and multi-family connections.

Agency Type: The City of Azusa's water system has been in operation since 1899, relying primarily on groundwater sources to supply water to consumers. In 1996, the City and Azusa Valley Water Company's water systems were combined into what is now known as Azusa Light and Water (ALW). ALW has three sources of water: groundwater from the Main San Gabriel Basin, surface water from San Gabriel River, and imported and treated water from through Upper District.

ALW's water system includes eleven operational wells, nine reservoirs, six booster pump stations, one Metropolitan connection, and two emergency water system connections. ALW also owns and operates the Canyon Filtration Plant (Canyon Plant) that treats surface water diverted from the San Gabriel River.

Water Demand: ALW's records are broken down by residential (single and multi-family), commercial, industrial, governmental, landscape and others. Demands in 2005 were 22,000 acre-feet and are projected to be 26,300 acre-feet in 2025.

Water Resources/Supply: ALW's primary source of water is groundwater, which is pumped from eleven operational wells. The total pumping capacity is approximately 25,000 gallons per minute (gpm).

ALW's water supplies consist of groundwater produced from the Main San Gabriel Basin, surface water from the San Gabriel River, and imported water from Metropolitan, which is purchased through Upper District. ALW's groundwater production was 23,835 acre-feet in fiscal year 2003-2004. ALW's surface water diversion for treatment is about 6,609 acre-feet (14-year average).

Water Quality: ALW is embarking on several water supply opportunities/projects that can help ensure water supply reliability. ALW plans to increase treatment capacity at its Canyon Plant. It is replacing the existing surface water treatment facility with a membrane treatment facility. The new facility will have a capacity of 12 MGD and can be expanded to 16 MGD. ALW has also identified potential uses of recycled water. Upper District, along with San Gabriel Valley MWD and in cooperation with the Main San Gabriel Basin Watermaster, proposed to implement a groundwater recharge program using recycled water referred to as the San Gabriel Valley Recycled Water Demonstration Project. Recycled water recharge over the long term is anticipated to average about 8,000 acre-feet/year.

Groundwater quality meets or exceeds all the California Department of Health Services drinking water standards, except for Well 10, which has nitrate concentrations above the MCL. In regards to surface water, ALW is periodically unable to treat its surface water diversions at the Canyon Plant due to high turbidity.

City of Monterey Park

Population: The City of Monterey Park's 2005 population was about 60,400. It is estimated to grow to 73,400 by 2025.

Service Area: The City of Monterey Park is located seven miles east of downtown Los Angeles in the westerly portion of the San Gabriel Valley. The City provides water to approximately 95 percent of the area located within the city limits.

Agency Type: The City is a local water purveyor that serves retail customers within its service area. The City has a legal right to pump groundwater from the Main San Gabriel Basin which it utilizes for its water supply.

Water Demand: All of the City's water demands have been met through groundwater production, except between fiscal years 2002-03 to 2004-05. The City had to purchase water from San Gabriel Valley Water Company when many of the City's wells were taken out of service due to groundwater contamination. The total water purchased from San Gabriel Valley Water Company from 2002-03 to 2004-05 was about 5,488 acre-feet. The City projects that its groundwater production wells will return to full service and there will not be a need to purchase water in the next 20 years.

The City's water use records are broken down by residential, commercial and industrial, agriculture, and institutional and governmental. Residential usage within the City's service area accounts for approximately 92.4 percent of total water used.

Water use in 2004-05 was 8,472 acre-feet/year and is expected to increase exponentially based on population growth. Water demands are projected to increase to 10,744 acre-feet/year in 2025.

Water Resources/Supply: The City has eleven wells which are located in the Main San Gabriel Basin. The City of Monterey Park's water supply sources consist entirely of groundwater produced from the Main San Gabriel Basin. Recycled water is not available in the City due to the great distance between the City and the water recycling facilities. Between fiscal year 1973-74 and 2004-05, the City's total water production from the Main Basin ranged from 7,372 acre-feet/year to 11,353 acre-feet/year.

The City of Monterey Park in conjunction with San Gabriel Valley MWD may participate in projects that facilitate the use of recycled water within its service area. These projects are currently in their planning stages. Additionally, the City is currently rehabilitating many of the wells that are non-operational to supplement current water supplies.

Water Quality: Most of the City's wells are affected by VOCs, perchlorate, and/or arsenic.

City of Sierra Madre

Population: The 2005 population of the City of Sierra Madre was 10,790 and is projected to be 11,679 in 2025.

Service Area: The City of Sierra Madre is located in the San Gabriel Valley region of Los Angeles County. The City is approximately 17 miles northeast of downtown Los Angeles at the base of the San Gabriel Mountains. The City covers approximately 3 square miles of land and ranges from relatively steep mountain canyon areas to gentle sloping land near the south edge of the City. The City is one of the older cities in Los Angeles County, bounded by the cities of Arcadia to the east and south, Pasadena to the west, and the Angeles National Forest to the north.

Agency Type: The City is a member of the San Gabriel Valley MWD. The City of Sierra Madre has no physical connection to San Gabriel Valley MWD. However, the City can access water indirectly by purchasing water via agreement with the City of Arcadia.

Water Demand: The City is virtually built out and anticipates a modest increase in demands through 2030. Demands in 2005 were 2,695 acre-feet and are projected to increase to 2,950 acre-feet by 2025.

Water Resources/Supply: The City's primary source of water supply is groundwater from the Raymond Basin, which is delivered to the system by four wells. The City has rights to pump 1,764 acre-feet/year from the basin. The City also owns two tunnels in the mountains above the City, one on either side of the Sierra Madre Dam. Currently, water is only used from the West Tunnel. The East Tunnel is being diverted to the spreading grounds due to high fluoride concentrations.

The City has five water storage reservoirs for a total storage volume of 6.7 million gallons. Each reservoir has a minimum of two boosters to pump water into the system. The City has one water system inter-connection with the City of Arcadia and two with the City of Pasadena for emergency purposes.

The City also operates spreading basins that replenish water back into the groundwater basin. The Sierra Madre Spreading Grounds are made up of 19 recharge basins, which total approximately 14 acres. The City is also participating in a regional program to extend the existing San Gabriel Valley MWD's Azusa Pipeline to provide untreated SWP water supplies to the City's spreading grounds for replenishment of groundwater

supplies. In exchange, the City could pump additional groundwater or purchase water, if needed. This is envisioned as a long term project taking ten years or more to complete.

Water Quality: The City owns two tunnels in the mountains above the City, one on either side of Sierra Madre Dam. Currently, water quality in the East Tunnel is high in fluoride concentrations preventing the use of this water supply.

Groundwater Basins

The Greater Los Angeles watershed area has several groundwater basins underlying the area varying in size, yield, conjunctive use potential, sediment type and water quality. The institutional construct to manage these basins also varies from no management to highly managed through either legislation or adjudication. This section summarizes the major groundwater basins in the watershed area. The information for this section has been taken from "Groundwater and Surface Water in Southern California, A Guide to Conjunctive Use" published by the Association of Groundwater Agencies, Department of Water Resources' (DWR) Bulletin 118 and verified with the different area groundwater basin managers.

San Fernando, Sylmar, Verdugo and Eagle Rock Basins

Location and Institutional Construct: These groundwater basins are located within the Upper Los Angeles River watershed and are managed by the Upper Los Angeles River Area (ULARA) Watermaster according to the San Fernando Judgment, which was completed in 1979. Cities that may produce from the basins include Los Angeles, Burbank, Glendale and San Fernando.

Safe Yield and Storage: The present operational safe yield of all three basins is 118,910 acre-feet/year. This yield comes from a combination of natural recharge and artificial recharge. Total freshwater storage capacity in the basins is approximately 3,700,000 acre-feet.

Sediments and Impacts on Recharge: Because the sediment type in the western portion of San Fernando Valley is composed of fine-grained materials, little recharge and thus production occurs in that portion of the basins. However, the eastern portion of the Valley is comprised of coarser materials. Thus, the majority of recharge and production occur from that portion of the Valley.

Water Quality: The highly industrialized nature of certain areas overlying the groundwater basins has caused significant water quality problems within portions of the aquifer. These problems include high concentrations of hexavalent chromium, VOCs (TCE and PCE), and nitrate. The basins have 4 sites on the National Priorities List (NPL) for hazardous substances, pollutants, or contaminants.

Conjunctive Use and Groundwater Treatment Projects: No conjunctive use projects are foreseen within the basin outside of the artificial recharge that currently occurs.

Raymond Basin

Location and Institutional Construct: The Raymond Basin is located within both the Upper Los Angeles River watershed and the Upper San Gabriel River and Rio Hondo watershed area. The basin was adjudicated in 1944 and is managed by the Raymond Basin Management Board.

Safe Yield and Storage: The present operational safe yield of the basin is 30,622 acre-feet/year. Actual annual production varies based on local storm runoff that is artificially recharged in the basin. As of June 30, 2004, the producers overlying the basin had approximately 60,850 acre-feet in storage. The freshwater storage capacity in the basin is approximately 250,000 acre-feet.

Sediments and Impacts on Recharge: The majority of the sediments of the basin is composed of boulders, gravel, sand, silt and clay, which allows for good recharge and production of water. The southwestern portion of the basin consists of consolidated sandstone, where recharge and production are poor.

Water Quality: There are five major contaminants that producers contend with. These are perchlorate, VOCs, nitrate, high fluoride levels and radiation. One NPL site is located within the Raymond Basin.

Conjunctive Use and Groundwater Treatment Projects: Foothill MWD has entered into a conjunctive use agreement with Metropolitan whereby up to 9,000 acre-feet can be stored at one time and up to 3,000 acre-feet/year may withdrawn from that storage for supply augmentation purposes. A larger scale conjunctive use project is also being explored with Metropolitan. Impacted overlying producers, in conjunction with Jet Propulsion Laboratories, have begun treatment for the VOCs and perchlorate. There may be an opportunity for further conjunctive use by extending San Gabriel Valley MWD's raw water pipeline to the Arroyo Seco for spreading purposes. Currently, only local stormwater runoff or treated water from Metropolitan is available for spreading. Replenishment deliveries from Metropolitan are made through injection or by in-lieu means.

Main San Gabriel Basin

Location and Institutional Construct: The Main San Gabriel Basin is located within the Upper San Gabriel River and Rio Hondo watershed area and underlies most of the San Gabriel Valley. The basin was adjudicated in 1972 and is managed by the Main San Gabriel Basin Watermaster, a nine-person board appointed by the Los Angeles County Superior Court. Although the Puente subbasin is hydraulically connected to the Main San Gabriel Basin, it is not legally considered part of the basin and is considered separate for this technical memorandum.

Safe Yield and Storage: The safe yield of the basin has ranged from 140,000 acre-feet/year to 240,000 acre-feet/year. On average, the safe yield is 200,000 acre-feet/year. The freshwater storage capacity in the basin is approximately 8.6 million acre-feet, of which approximately 1,000,000 is usable for water supply. Recharge occurs both artificially and naturally. However, artificial recharge of the basin cannot occur once the Baldwin Park Key well water level exceeds 250 feet in elevation. At this point, only recharge at the eastern end of the basin may occur.

Sediments and Impacts on Recharge: The basin sediments consist primarily of unconsolidated and semi-consolidated sediments ranging from fine-grained sands to coarse gravel, resulting in good recharge and production.

Water Quality: VOCs and NDMA are the major contaminants found in the Main San Gabriel Basin. Three NPL sites are located within the Basin.

Conjunctive Use and Groundwater Treatment Projects: Conjunctive use in the basin occurs through the advanced delivery of replenishment water that the Watermaster is able to purchase when required and surface replenishment deliveries are unavailable. The Watermaster, in conjunction with the Water Quality Authority and responsible parties, continues to construct treatment facilities for contaminated groundwater.

Puente Basin

Location and Institutional Construct: Puente Basin is located within the Upper San Gabriel River and Rio Hondo watershed area. The basins were adjudicated in 1986. The basin management plan is administered by a three-person watermaster.

Safe Yield and Storage: The safe yield of the basin is presently set at 1,500 acre-feet and estimated to be set for the next four years to be 1,750 acre-feet.

Sediments and Impacts on Recharge: Closer to the San Gabriel Mountains, the aquifer consists of sand and gravel deposits. As the distance increases from the San Gabriel Mountains, the sediment changes to silt and clay.

Water Quality: Puente Basin is high in TDS and VOCs.

Conjunctive Use and Groundwater Treatment Projects: The basin lies within the San Gabriel Valley Superfund site, and the western half of the basin lies with the EPA's Puente Valley Operable Unit. Carrier Corporation also produces water, removes PCE and discharges that water into San Jose creek. Puente Basin Water Agency receives credit for that discharged water under the Puente Narrows Agreement with Upper San Gabriel Valley MWD. Several other sites have been identified with contaminants where the Regional Board has issued Clean-up and Abatement Orders. Some sites have completed the requirements of their orders and have been granted closures.

Additionally, Walnut Valley produces the groundwater and blends it with recycled water from the Pomona Water Reclamation Plant prior to delivery.

Six Basins

Location and Institutional Construct: Six Basins is comprised of San Antonio Canyon Basin, Live Oak Basin, Upper Claremont Heights Basin, Lower Claremont Heights Basin, Pomona Basin and Ganesha Basin. A portion of the Six Basins is located within the Upper San Gabriel River and Rio Hondo watershed area. The basins were adjudicated in 1999.

Safe Yield and Storage: The safe yield of the basins is presently 18,000 acre-feet. The total freshwater storage capacity of the basins is 300,000 acre-feet.

Sediments and Impacts on Recharge: Closer to the San Gabriel Mountains the aquifer consists of sand and gravel deposits. As the distance increases from the San Gabriel Mountains, the sediment changes to silt and clay.

Water Quality: Contaminants of concern for overlying producers are nitrate and VOCs. Another issue of concern for Six Basins is rising groundwater levels and issues that are associated with that.

Conjunctive Use and Groundwater Treatment Projects: Currently, 2,000 acre-feet of contaminated groundwater is being produced from the basin treated and then used. This is expected to increase to 5,000 acre-feet.

Santa Monica and Hollywood Basins

Location and Institutional Construct: Santa Monica Basin and Hollywood Basin are located within the South Bay watershed areas. The basins are neither adjudicated nor formally managed.

Safe Yield and Storage: The safe yield of Hollywood Basin is 4,400 acre-feet/year, and the Santa Monica Basin safe yield is 100 acre-feet/year. The information for available storage in the Hollywood and Santa Monica Basins is not available.

Sediments and Impacts on Recharge: The sediments within the basins vary. There is a layer of silty clay and clay in the coastal areas, which tends to confine the basin.

Water Quality: The main water quality concern in the Charnock subbasin of the Santa Monica basin is MTBE. The main water quality concern in the Hollywood Basin is high TDS, iron and manganese.

Conjunctive Use and Groundwater Treatment Projects: Neither basin is large enough to develop large scale conjunctive use programs. However the City of Beverly Hills completed construction of a groundwater treatment plant in 2003 to remove high concentrations of salt from the groundwater basin and deliver the then treated groundwater to its customers. The City of Santa Monica is pursuing remediation of MTBE in the Charnock subbasin, which has impacted its water supplies.

Central and West Coast Basins

Location and Institutional Construct: The Central Basin and West Coast Basins are located within the South Bay and San Gabriel and Lower Los Angeles River watershed areas. Both groundwater basins have been adjudicated. DWR is the watermaster, and the Water Replenishment District of Southern California manages the basins.

Safe Yield and Storage: The total allowable pumping from Central Basin is 217,367 acre-feet/year and the total allowable pumping from the West Coast Basin is 64,468 acre-feet/year. According to WRD, the available storage in both basins is 450,000 acre-feet.

Sediments and Impacts on Recharge: The sediments within the basins vary. There is a layer of silty clay and clay in the coastal areas, which tends to confine the basin. This contrasts with the Montebello and Los Angeles Forebays, where the aquifers are hydraulically connected to the ground surface, and there is no presence of the silty clay, thus allowing for recharge of surface water.

Water Quality: VOCs, semi-volatile organic compounds, DDT, chlorobenzene, benzene hexachloride, inorganic compounds and polynuclear aromatic hydrocarbons are the major contaminants found in the basins. Seven NPL sites are located within the basins.

Conjunctive Use and Groundwater Treatment Projects: Long Beach, Central Basin and Lakewood have entered into conjunctive use programs with Metropolitan whereby up to a total of 16,500 acre-feet may be stored in the basin for annual production of up to 5,500 acre-feet for supply augmentation. Both Central Basin and West Basin have projects that recover poor quality water from the basins, treat it and deliver the processed water to customers.

Orange County Groundwater Basin

Location and Institutional Construct: A portion of the Orange County groundwater basin is located within the San Gabriel and Lower Los Angeles River watershed area. The basin is not adjudicated but is managed by the Orange County Water District formed specifically to manage and protect the groundwater basin.

Safe Yield and Storage: The safe yield of the Orange County basin is presently 260,000 acre-feet/year. Due to continued urbanization in the upper Santa Ana River watershed, it is expected that the current safe yield will increase by roughly 2,500 acre-feet/year for the foreseeable. The safe yield is augmented by purchasing replenishment water from Metropolitan and injecting reclaimed water into the basin. The yield from the basin due to this supply augmentation for the current year will be 318,000 acre-feet. When the Groundwater Replenishment System (described below) comes on line in 2007-08 it is estimated that the overall basin yield will increase to about 380,000 acre-feet/year.

Sediments and Impacts on Recharge: The types of sediments within the basin vary. A coarse-grained unconfined forebay area is located in the northeast portion of the basin whereas finer-grained sediments overly the coarser-grained sediments in the central and coastal areas of the basin. Thus, the northeast portion of the basins recharge capacity is highly permeable, whereas the central portion of the basin and moreover the coastal area has little or no percolation of groundwater.

Water Quality: VOCs are the major contaminants found in isolated portions of the basin. Additionally, colored groundwater and seawater intrusion are an issue for producers. One NPL site is located within the basin that underlies the Greater Los Angeles regions watershed area, although three NPL sites are located within the basin.

Conjunctive Use and Groundwater Treatment Projects: There is a conjunctive use agreement with Metropolitan through MWDOC and OCWD to store up to 60,000 acre-feet of water in the basin and produce up to 20,000 acre-feet/year for supply augmentation. Additionally, conjunctive use is done through various replenishment programs. Treatment for colored groundwater is also done in various coastal areas. Additionally, OCWD is constructing a Groundwater Replenishment System that will process previously treated wastewater effluent further by using an advanced treatment process that includes two membrane filtration systems - microfiltration and reverse osmosis disinfection and treatment by ultraviolet light and hydrogen peroxide. This water will then be either recharged or injected into the groundwater basin to either blend with the groundwater for water supply or be used as a barrier for seawater intrusion.

Sanitation Districts and Other Wastewater Treatment Agencies

Table A-1 presents key information relevant to the IRWMP such as discharge point for treated effluent, current permitted secondary and tertiary capacities, and recycled water average flows, for each of these 15 main treatment plants. This information is used in Section 5 of this technical memorandum as a basis to discuss current recycled water strategies and opportunities for improvements and integration.

Physical System for Delivering Water

This section describes the recycled water facilities used to deliver water within the Region.

Recycled water facilities

Two categories of recycled water facilities are considered for the purpose of this TM and discussed below: (1) treatment facilities, and (2) major conveyance and distribution facilities, which include pipelines, storage, and pumping facilities.

Treatment Facilities

Key information on the treatment facilities is summarized above.

Major Conveyance and Distribution Facilities

In this early phase of the IRWMP, the type of information needed about existing and planned conveyance and distribution facilities has not yet been established. Instead of describing these facilities, readily available documents (see Reference section) were reviewed and best available source of information was identified. Maps illustrating existing and planned conveyance and distribution facilities were of particular interest. These maps could be used later on during the IRWMP preparation to illustrate potential projects or potential opportunities for integration. Table A-2 therefore lists the best recycled water facilities maps available in published documents by recycled water retail agency.

The level of detail and accuracy of maps representing recycled water facilities varies greatly from one document to another. Most of the maps illustrate existing and planned pipeline alignments; however information such as pumping or storage facilities location is not typically provided or displayed. Note that the Southern California Comprehensive Water Reclamation and Reuse Study (SCCWRRS) (CH2MHill, 2002) includes a number of figures representing existing and future recycled water facilities within the planning area. However, because SCCWRRS used a GIS-based model to create the recycled water distribution networks and

to help identify necessary facilities needed to distribute recycled water from recycled water supply source to users, the future recycled water facilities shown on the maps included in SCCWRRS are not necessarily reflecting facilities planned by the recycled water retail agencies.

Table A-1. Wastewater Treatment Facilities within the Planning Area

Publicly-Owned Wastewater Agencies	Treatment Facility [1]	IRWMP Sub-Region	Effluent Discharge Point	Secondary Permitted Capacity	Tertiary Permitted Capacity	Secondary Planned Expansions	Tertiary Planned Expansions	Current Secondary Annual Average Production		Current Recycled Water Annual Average Production		Current Amount of Recycled Water Reused[2]			Sources
												M&I	Environmental Enhancement	Groundwater Recharge or Seawater Barrier	
				mgd	mgd	mgd	mgd	mgd[13]	Acre-feet	mgd[13]	acre-feet	acre-feet	acre-feet	acre-feet	
Burbank, City of (Department of Public Works)	Burbank WRP	ULAR	LA River via stormwater system	9	9	--	--	6	6,700	6	6,700	1,100	0	0	www.ci.burbank.ca.us Burbank 2005 UWMP (main source) Draft EIR, Nov 2005
LACSD	Joint Water Pollution Control Plant	SB	Pacific Ocean (Santa Monica Bay)	320	0	--	--	322	361,310	0	0	0	0	0	www.lacsd.org 15th Annual Status Report on RW Use (LACSD, 2004)
	La Canada WRP	ULAR	Flintridge Country Club	0.2	0	--	--	0.1	110	0	0	110	0	0	
	Long Beach WRP	SGR & LLAR	Ocean	25	25	--	--	21	23,010	21	23,010	5,820	0	135 [3]	
	Los Coyotes WRP	SGR & LLAR	San Gabriel River	38	38	--	--	32	35,380	32	35,380	5,870	0	0	
	Pomona WRP	SGR	San Jose Creek	15	15	--	--	9	10,380	9	10,380	6,200	0	2,360 [4]	
	San Jose Creek WRP	SGR	San Jose Creek	100	100	--	--	83	93,390	83	93,390	4,150	0	27,490 [5]	
	Whittier Narrows WRP	SGR & LLAR	Rio Hondo	15	15	--	--	7	8,220	7	8,220	70	0	5,970 [6]	
Los Angeles, City of (Department of Public Works, Bureau of Sanitation)	Terminal Island TP	SB	Pacific Ocean	30	0	--	4 [7]	16	17,920	4	4,480	0	0	4,480 [7]	www.lasewers.org LA DWP 2005 UWMP (main source) LA IRP Draft EIR 2005
	Hyperion TP	SB	Pacific Ocean (Santa Monica Bay)	450	0	50*(2020)*	--	350	392,000	0	0	0[8]	0[8]	0[8]	
	LA-Glendale WRP	ULAR	LA River	15 [9]	15 [9]	5 [9]	5 [9]	15	16,800	15	16,800	1,600	0	0	
	Tillman WRP	ULAR	LA River	64 [9]	64 [9]	16 [9]	16 [9]	52	58,250	25	28,500	0	28,500 [10]	0	
Las Virgenes MWD	Tapia WRP	NSMB	Malibu Creek	16	16	--	--	7	7,440	4	4,590	4,590	0	0	www.lvmwd.dst.ca.us LVMWD 2005 UWMP
West Basin MWD [11]	El Segundo Water Recycling Plant (Title 22 Filter Plant), Carson RWRP, & Mobil BFP	SB	NA	0	30 [12]	0	10 *(2006)*	0	0	21	24,070	20,270	0	0	www.westbasin.com WB 2005 UWMP (main source)
	El Segundo Water Recycling Plant (Advanced Treatment System)	SB	NA	0	12	0	8 *(2010)*	0	0				0	3,800 [13]	
Total [15]:				1,200	340	70	45	920	1,030,900	225	251,000	49,800	28,500	44,200	

Notes:

GWR: Groundwater Recharge; SWB: Seawater Barrier; LLAR: Lower Los Angeles River Region; M&I: Municipal & Industrial; NA: not applicable; N/A: not available; NSMB: North Santa Monica Bay Region; SB: South Bay Region; SGR: San Gabriel River Region; WRP – Water Reclamation Plant; TP – Treatment Plant; ULAR: Upper Los Angeles River Region; all numbers have been rounded to the nearest 1mgd or 10 acre-feet/year, except for La Canada WRP.

1. *Only main wastewater treatment facilities with a permitted capacity of 0.2 mgd or more are listed, which excludes Los Angeles County Malibu Mesa WTF. Existing or planned urban-runoff treatment facilities are not listed.*
2. *Reclaimed water that is produced but not reused is discharged. List of recycled water retail agencies is provided in a separate table in the TM.*
3. *Alamitos Seawater Intrusion Barrier.*
4. *Groundwater recharge via an unlined portion of the San Gabriel River located downstream of the treatment plant.*
5. *Groundwater recharge via the San Gabriel and Rio Hondo spreading grounds*
6. *Groundwater recharge via the Rio Hondo spreading grounds*
7. *Advanced treatment of portion of the flow. Currently planned recycled water use for seawater barrier (Dominguez Gap Seawater Intrusion Barrier) and industrial and landscaping uses in the harbor area.*
8. *Secondary effluent is wholesaled to West Basin MWD for reuse; 350 acre-feet/year of tertiary effluent is then sold back to City of LA (Department of Water and Power) for irrigation use as part of the Westside Water Recycling Project. These 350 acre-feet/year are captured under West Basin MWD numbers.*
9. *These capacities reflect potential reduction due to nitrification-denitrification project currently in progress. Tillman and LAG capacities prior to derating were 80 mgd and 20 mgd, respectively.*
10. *4,400 acre-feet/year to lake and landscaping at the Japanese Garden; 7,800 acre-feet/year for wildlife habitat management; 16,300 acre-feet/year to Lake Balboa.*
11. *Although West Basin MWD is not a wastewater agency, it was listed herein since it owns and operates large recycled water treatment facilities.*
12. *Carson RWRP RO facility has a 5 mgd permitted capacity. The Mobil BFP is treating 3.2 mgd to advanced treatment.*
13. *West Coast and Dominguez Gap Seawater Intrusion Barriers.*
14. *Calculated based on acre-feet/year provided in various sources used.*
15. *Rounded to nearest 5 mgd and 100 acre-feet/year. Total may vary slightly due to rounding.*

Table A-2. Best[1] Recycled Water Facilities Maps Available in Published Documents

Member Agency	Information Displayed [2]	Source
Burbank, City of	Reuse Sites Pump Stations Location Pipelines General Alignment [3] Treatment Facilities Location	2005 Burbank UWMP SCCWRRS (Figure 5-1) [4]
Calleguas MWD	Pump Stations Location Pipeline General Alignment [3] Treatment Facilities Location	2005 CMWD UWMP SCCWRRS (Figures 5-1, ES-4) [4]
Central Basin MWD	Pump Stations Location Pipeline General Alignment [3] Treatment Facilities Location	2005 CB UMWP www.centralbasin.com LACSD 15th Annual Status Report (FY 03-04) SCCWRRS (Figures 5-1, ES-7, ES-8, ES-9) [4]
Glendale, City of	Pump Stations Location Pipeline General Alignment [3] Treatment Facilities Location	2005 Glendale UWMP 2005 Pasadena RW Feasibility Study SCCWRRS (Figure 5-1) [4]
Las Virgenes MWD	Pump Stations Location Pipeline General Alignment [3] Treatment Facilities Location	SCCWRRS (Figures 5-1, ES-4) [4]
Long Beach, City of	Pump Stations Location Pipeline General Alignment [3] Treatment Facilities Location	2005 LB UWMP LB Water Department CIP FY 05-06 to FY 09-10 LACSD 15th Annual Status Report (FY 03-04) SCCWRRS (Figure 5-1,ES-6, ES-7, ES-9) [4]
Los Angeles, City of	Pump Stations Location Pipelines General Alignment & Sizes [3] Treatment Facilities Location	2005 LA DWP UWMP 2005 IRP SCCWRRS (Figure 5-1,ES-6) [4]
MWD of Orange County	Pump Stations Location Pipelines General Alignment [3] Treatment Facilities Location	MWDOC 2005 UWMP SCCWRRS (Figures 5-2,ES-8, ES-9) [4]
Pasadena, City of	Reuse Sites [4] Pipelines General Alignment [3]	2005 Pasadena RW Feasibility Study
Three Valleys MWD	Pump Stations Location Pipelines General Alignment [3] Treatment Facilities Location	LACSD 15th Annual Status Report (FY 03-04) SCCWRRS (Figures 5-1, ES-5) [4]
Torrance, City of	Pump Stations Location Pipelines General Alignment [3] Treatment Facilities Location	SCCWRRS (Figure 5-1,ES-6) [4]
Upper San Gabriel MWD	Pump Stations Location Pipelines General Alignment [3] Treatment Facilities Location	SCCWRRS (Figures 5-1,ES-5) [4]
West Basin MWD	Pump Stations Location Pipelines General Alignment [3] Treatment Facilities Location	2005 WB UMWP www.westbasin.com SCCWRRS (Figures 5-1, ES-6) [4]

Notes:

- *Best for the purpose of the IRWMP; i.e., illustrating general location and characteristics of existing and planned recycled water facilities.*
- *Maps are hard-copies and not currently available in an electronic or GIS format.*
- *Not all existing and planned recycled water pipelines are necessarily shown on described maps.*
- *The Southern California Comprehensive Water Reclamation and Reuse Study (SCCWRRS) (CH2MHill, 2002) used a GIS-based model to create*

Table A-2. Best[1] Recycled Water Facilities Maps Available in Published Documents

Member Agency	Information Displayed [2]	Source
	the recycled water distribution networks and to help allocate and distribute recycled water from supply sources to demand points. The SCCWRRS' model displays existing, planned, and ADM proposed recycled water pipelines; not necessarily all pipelines shown on the SCCWRRS maps are existing or planned by the respective agency. Accuracy of existing and planned pipelines shown on SCCWRRS maps is not detailed. Pipeline sizes are not shown.	

APPENDIX B

WATER SUPPLY MANAGEMENT STRATEGY ANALYSIS

Groundwater, Groundwater Management and Conjunctive Use

Groundwater Management

As mentioned previously, most groundwater basins in the Region are adjudicated. These basins must follow the management guidelines established by their respective adjudications. Exceptions are the Orange County Basin, Santa Monica Basin and Hollywood Basin. Orange County Basin is managed by OCWD which was formed by a special act of the California State Legislature to protect Orange County's rights to water in the Santa Ana River. OCWD's primary responsibility is managing the vast groundwater basin under north and central Orange County that supplies water to more than 20 cities and water agencies, serving more than 2 million Orange County residents. Santa Monica Basin and Hollywood Basin are also not adjudicated or managed. As part of its remediation efforts Santa Monica plans to implement a groundwater management plan.

Groundwater Conditions

Based on the Association of Ground Water Agencies publication "Groundwater and Surface Water in Southern California, A Guide to Conjunctive Use", DWR's Bulletin 118 and a survey sent to the Region's basin managers, the following table summarizes basin conditions in the Region's service area.

Table B-1. Groundwater Basin Description

Groundwater Basin	Surface Area of Basin (Square Miles)	Current Operational Safe Yield	Freshwater Storage Capacity	Amount of Usable Water in Storage
Central Basin	278	217,367	13,800,000	789,000
Hollywood Basin	16	4,400	200,000	-
Main San Gabriel Basin	167	240,000	8,600,000	500,000
Orange County Basin	70	70,000	200,000	60,000
Puente	-	1,500	-	-
Raymond Basin	40	30,622	1,450,000	56,000
Santa Monica Basin	46	100	1,100,000	-
Six Basins	-	18,000	300,000	30,000
ULARA	190	118,910	3,700,000	-
West Basin	172	64,468	6,500,000	300,000
Total	979	765,367	35,850,000	1,735,000

Based on the information presented above, if the facilities exist and costs are more competitive, then there is a significant amount of additional freshwater capacity in groundwater basins that could be used to meet retail demands. However, restricting factors have been facilities and costs. Additionally, recharging the basins once they have been drafted may be cumbersome considering lack of recharge capability in some of the areas.

Cost to Pump Groundwater

Most of the time, it is more cost effective to pump groundwater rather than purchase water from Metropolitan if all other factors are equal. Thus, most groundwater agencies' strategy is to produce as much groundwater feasible and meet the balance of demands through imported water.

The costs to produce groundwater include the capital costs of the wells and appurtenant facilities, maintenance costs of those wells and power costs and treatment. If the groundwater quality is good, water is typically injected with chlorine and ammonia to form chloramines before it is put into an agency's distribution system. Power costs tend to be the largest variable in the production of groundwater if no water quality concerns exist. Power costs depend mostly on the amount of lift needed to bring the groundwater to surface level. As an example, a well and its appurtenant facilities were constructed at a cost of $2.5 million. It produces 2,000 acre-feet annually and has a life expectancy of 15 years prior to any major rehabilitation. The amortization rate is set at 5 percent for the capital costs. Additionally, it has a lift of 500 feet at $.10 per foot power costs. Annual maintenance costs are minimal at a cost of $1,000 for the well and treatment costs are $1,500 per year. Thus, the cost per acre-feet for water produced from this well is $170.

However, agencies are only able to produce groundwater up to annual yield limitations without significantly impacting groundwater levels. Agencies that produce groundwater without consideration of yield limitations will eventually need to reduce pumping or stop all together as basin levels decline and the health of the basin is put at risk. Additionally, should the groundwater be contaminated, significant costs will be incurred to treat ground water.

Replenishment

Many of the groundwater basins in the Region include artificial recharge as a means of maintaining basin levels and pumping levels. Artificial recharge source water can be either local or imported water. Spreading grounds are typically used to recharge local water whereas imported water recharge can occur through direct means using spreading grounds or injection wells or by in-lieu means. In some instances, spreading is limited because of the capacity limitations of the spreading facilities rather than water supply. Recharge by in-lieu means does not require facilities. It simply requires that an agency suspend production from its wells and meet retail demand needs through deliveries of imported supplies. Groundwater levels in the basin will then increase because of the reduction in pumping.

Most of the time, imported water used for replenishment purposes is provided at a discounted rate. Currently the discount from Tier 1 rates is $118/acre-feet for treated replenishment water and $93/acre-feet for untreated replenishment water. This pricing allows agencies overlying groundwater basins with recharge operations to reduce their overall cost of water in comparison to purchasing Tier 1 or Tier 2 supplies from Metropolitan. In exchange for the lower rates, Metropolitan is able to interrupt replenishment deliveries upon immediate notice for direct injection or spreading and 48 hours notice for in-lieu replenishment.

This interruption in deliveries by Metropolitan can occur because of system capacity or supply constraints. A limit has not been placed on how long Metropolitan can interrupt replenishment deliveries but it is expected that most groundwater basins can handle a two or three year interruption in deliveries without having to reduce groundwater production. This is because the larger groundwater basins can act as underground reservoirs and hold significant quantities of water in storage for use during an interruption. Typically the smaller basins do not participate in Metropolitan's replenishment program since they do not have significant storage and cannot handle an extended interruption.

For San Gabriel Valley MWD, currently all imported water delivered to its member agencies is done through spreading to make-up for water the agencies have produced beyond their rights to pump. Should there not be enough State Project water available to meet this obligation to make-up water, San Gabriel Valley MWD

has an account in the basin that it can use to access supplies it has previously stored. This water is then sold to the Watermaster. This sale is simply a paper transfer of a previous delivery to meet adjudication requirements.

Conjunctive Use

In addition to replenishment operations as described above, there are other forms of conjunctive use programs. These are typically contractual agreements with Metropolitan either funded through Metropolitan or through a combination of Metropolitan and Proposition 13 money. The basic principles behind a majority of these conjunctive use agreements are:

1. Metropolitan pays for the construction of facilities that allow them to place and extract water from a groundwater basin;
2. The agency is responsible for constructing the facilities;
3. These facilities cannot be used by the agency to increase normal year production.
4. Metropolitan can place a maximum amount of water into storage which can be extracted equally over three years when needed by Metropolitan. This account can be cycled several times as needed over the term of the contract.
5. Water is delivered at no charge for placement into storage.
6. An accounting of the water is maintained separately.
7. The agency pays Metropolitan's full service rate when the water is extracted.
8. The contract is for 25-years, renewable if both parties agree.
9. Water in Metropolitan's account at the end of the contract is purchased by the agency at the full service rates.

Metropolitan also has cyclic storage agreements with some agencies. These accounts help balance replenishment demands in groundwater basins where agencies are able to produce above their rights and purchase replenishment water to make-up for the overproduction. With these agreements, Metropolitan is able to deliver replenishment water into a basin prior to when it is needed. When the basin's Watermaster reconciles actual production with rights to produce a need for replenishment purchases arises. Should Metropolitan not have supplies or system capacity available, it may sell water from this account. This water is sold at the replenishment rate when transferred from the account.

Basin Water Quality and Treatment including Desalination

When a groundwater basin's quality meets all SDWA requirements, typically the only treatment needed is injection of chlorine and ammonia prior to introduction into an agency's distribution system. However, in the Region, groundwater basin water quality is a significant issue. Many factors have contributed to the deterioration of water quality in portions of certain groundwater basins including:

1. Historic overdrafting of groundwater basins causing seawater intrusion,
2. Industrial discharges,
3. Farming and the chemical usage associated with farming,
4. Military operations
5. Chemicals contained in urban runoff, and
6. Naturally occurring organics.

The cost of treating these contaminants is often significant. Additionally, effective treatment has not yet been identified for some chemicals and testing needs to be performed of different treatment methods prior to

identifying the preferred treatment alternative. Some of the contamination is extensive and several sites are on EPA's National Priorities List for remediation. The cost to treat this groundwater is typically in the millions of dollars.

One example is the Baldwin Park area where VOCs have been detected 1000 times above the MCLs. A map of the contamination is shown in Figure C-1 below. Responsible parties have been identified which are obligated to pay for this remediation. However, it has taken years for this remediation project to begin. VOCs were identified in the 1980s. An agreement was finally reached in the late 1990's to begin treatment. However, other contaminants were then found and new treatment methods had to be identified. Finally, in 2000, the first treatment began of the VOCs, NDMA and perchlorate in the contaminated area.

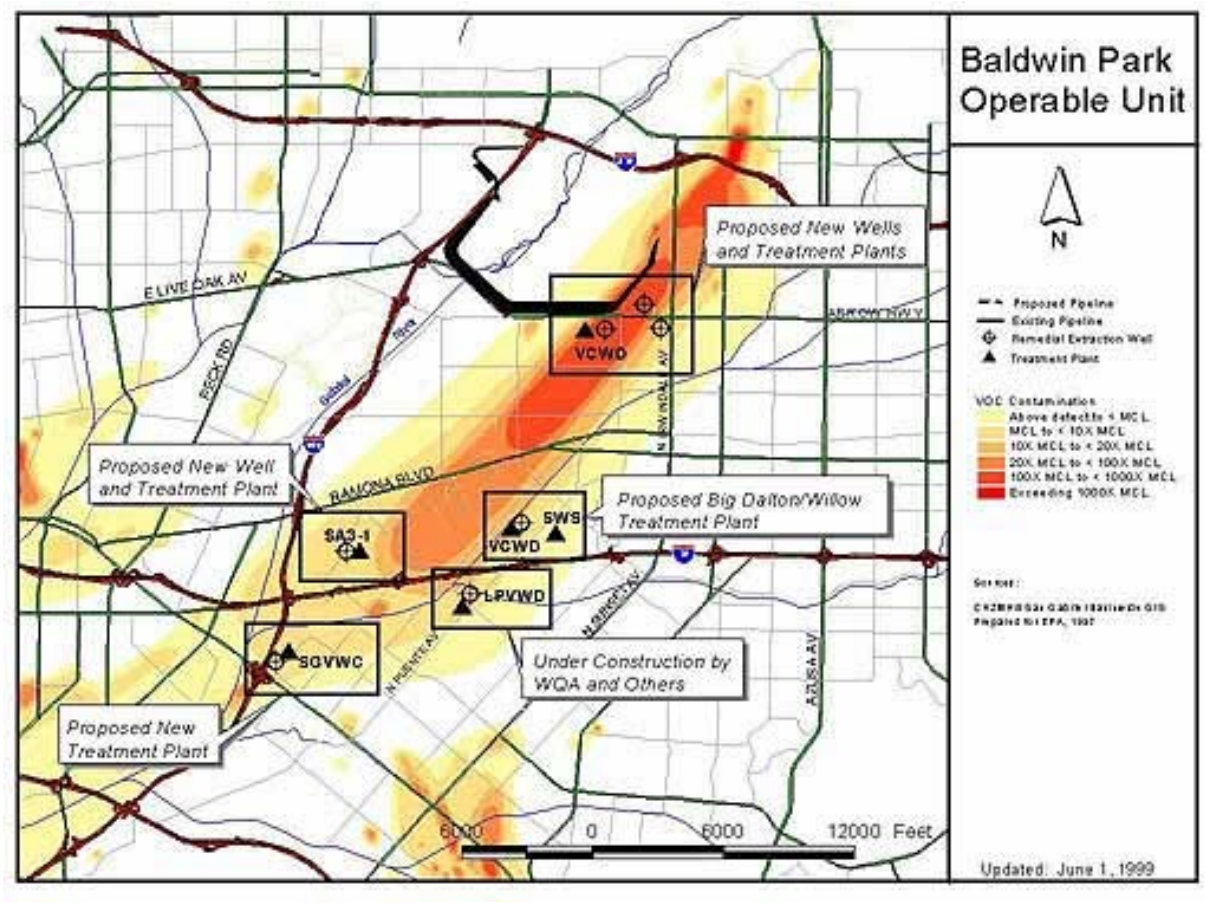

Figure B-1. Baldwin Park Operable Unit

Additionally, some basins have high TDS levels either in all or a portion of the basin caused by seawater intrusion, naturally occurring organics, or previous practices. Hydraulic barriers have been maintained to prevent further seawater intrusion. However, the cost of recovering brackish groundwater is typically significantly more expensive than developing other supplies. Thus, this supply management strategy has been limited.

Recycled Water

In general, the Recycled Water Strategy analysis is based on the following documents (see Reference section for exact references):

- Metropolitan 2004 IWRP Update
- City of LA 2005 IRP
- Metropolitan 2005 RUWMP
- Metropolitan and San Gabriel Valley MWD member agencies 2005 UWMPs (including reports to CUWCC)
- Southern California Comprehensive Water Reclamation and Reuse Study, US Bureau of Reclamation (CH2MHill, 2002), and subsequent documents associated with the Southern California Water Recycling Projects Initiative
- Water Recycling 2030, Recommendations of California's Recycled Water Task Force (Task Force, 2003)
- Fifteenth Annual Status Report of Reclaimed Water Use, Fiscal Year 2003-2004, Sanitation Districts of Los Angeles County (LACSD, 2005; latest report available)

Additional information was obtained from the following sources:

- Workshop 1 and Workshop 2 meeting minutes for the sub-regions.
- Input from LACSD, West/Central Basin Municipal Water District and LADWP obtained during individual meetings or phone conversations with the agency recycled water coordinator.

Documents that were considered or briefly reviewed, but did not serve as the basis to develop the section below (because the information provided in the documents listed above was considered comprehensive enough, or because the documents were still being developed):

- Member agencies most recent Recycled Water Master Plans, if any
- Other special studies (e.g., Tapia Effluent Alternatives Report)

Challenges

General challenges associated with expanding recycled water use experienced by wastewater and water agencies throughout the State were compiled and analyzed in the Water Recycling 2030, Recommendations of California's Recycled Water Task Force (DWR, 2003). The challenges were categorized into six issue areas:

- Funding for water recycling
- Public dialogue and outreach
- Plumbing code and cross-connection control
- Regulations and permitting (including salinity management)
- Economics of water recycling
- Science and health/Indirect potable reuse

The Task Force adopted recommendations for each challenge identified within the six issue areas, as well as an implementation plan for these recommendations (including implementing agency, and implementation timeframe). Examples of recommendations include:

- Increase State and federal funding for reuse/recycling beyond current sources
- Engage the public in an active dialogue using a community value-based decision-making model in planning water recycling projects
- Convene a Statewide panel to recommend changes to public schools and higher education curriculum
- Prepare DHS guidance to achieve a more consistent interpretation of State standards
- Legislation to increase local flexibility to regulate water softeners

- State to use information from regional studies to prioritize funding for projects encompassed under a regional plan; without excluding projects where regional plans do not exist

Most of the challenges identified by the Task Force and associated recommendations apply to the planning area and should be considered in the development of the IRWMP in terms of opportunities to advance some of these recommendations through projects, or opportunities to integrate relevant recommendations in the IRWMP implementation plan.

Even though agencies faced general challenges as described above, there are also barriers associated with the local setting. Key challenges preventing recycled water use expansion at the local level were identified based on the document and sources listed earlier in this section. Table B-2 summarizes these challenges for each of the 24 member agencies considered in this Memo.

Table B-2. Key Challenges to Recycled Water Program Expansion in the Planning Area

Member Agency	Recycled Water Source		Key Challenges Preventing Further Recycled Water Use Expansion [2]
	Current	Other Potential Source [1]	
Alhambra, City of	• None	• LA-Glendale WRP • San Jose Creek WRP	• No existing connection to a recycled water source • No existing distribution system
Azusa, City of	• None	• Pomona WRP • San Jose Creek WRP	• No existing connection to a recycled water source • No existing distribution system
Beverly Hills, City of	• None	• LA-Glendale WRP • West Basin WRP	• No existing connection to a recycled water source • No existing distribution system
Burbank, City of	• Burbank WRP	• Not considered	• Lack of revenue to support program build-out
Calleguas MWD	• Tapia WRP	• None	• Cost-effectiveness of recycled water • Inter-agency coordination
Central Basin MWD	• Los Coyotes WRP • San Jose Creek WRP	• Not considered	• Cost-effectiveness of recycled water
Compton, City of	• None	• West Basin WRP • Carson Regional WRP	N/A (UWMP not available)
Foothill MWD area	• La Canada WRP	• LA-Glendale WRP	• Limited capacity of current treatment facilities • No existing distribution system
Fullerton, City of	• None	• Los Coyotes WRP	• No existing connection to a recycled water source • No existing distribution system
Glendale, City of	• LA-Glendale WRP	• Not considered	• Cost-effectiveness of recycled water • Limited potential recycled water market • Water quality issue
Las Virgenes MWD	• Tapia WRP	• Not considered	• Limited Title 22 treatment capacity • Cost-effectiveness of recycled water • Limited potential recycled water market
Long Beach, City of	• Long Beach WRP • Terminal Island TP	• Not considered	• Permitting issues • Cost-effectiveness of recycled water
Los Angeles, City of	• Tillman WRP	• None	• Planned groundwater recharge could not be implemented (political/ public perception) • Chloride levels of concerns to RWQCB

Table B-2. Key Challenges to Recycled Water Program Expansion in the Planning Area			
Member Agency	Recycled Water Source		Key Challenges Preventing Further Recycled Water Use Expansion [2]
	Current	Other Potential Source [1]	
Monterey Park, City of	• N/A	• Whittier Narrow • San Jose Creek WRP	• No existing connection to a recycled water source • No existing distribution system
Pasadena, City of	• None	• LA-Glendale WRP	• No existing connection to a recycled water source • No existing distribution system
San Fernando, City of	• None	• Tillman WRP • Burbank WRP	• No existing connection to a recycled water source • No existing distribution system
San Marino, City of	• None	• San Jose Creek WRP	• No existing connection to a recycled water source • No existing distribution system
Santa Monica, City of	• None [2]	• West Basin WRP	• No existing connection to a recycled water source • No existing distribution system
Sierra Madre, City of	• None	• San Jose Creek WRP	• No existing connection to a recycled water source • No existing distribution system • Cost-effectiveness of recycled water
Three Valleys MWD	• Pomona WRP	• Not considered	• Limited Title 22 treatment capacity • Cost-effectiveness of recycled water
Torrance, City of	• West Basin WRP	• Not considered	• Cost-effectiveness of recycled water • Time to complete on-site retrofits • Prohibitive costs to extend pipelines
Upper San Gabriel MWD	• San Jose Creek WRP • Whittier Narrow WRP	• Not considered	• Limited potential recycled water market • Lack of incentives to use recycled water • Limited recycled water availability
West Basin MWD	• West Basin (El Segundo) WRP • Carson Regional WRP • Chevron RO Facility • Barrier TP	• Not considered	• Time to complete on-site retrofits • Marketability of recycled water (price, public perception, water quality) • Need to upgrade or upsize treatment and conveyance facilities • Cost-effectiveness of recycled water

Notes:
Potential source recycled water treatment facility takes into account location of tertiary treatment plants, existing and planned recycled water distribution systems, and physical barriers (e.g. mountains, dense urban area).
Based on UWMPs.
Excluding S.M.U.R.R.F.

Key challenges associated with expanding recycled water use that should be considered in the development of the IRWMP are discussed below, along with potential pathways to addressing these challenges through the IRWMP.

- Seasonal variations in recycled water demand for irrigation – Seasonal variations in recycled water demand associated with irrigation use leads to excess recycled water available during the winter month. Seasonal storage of recycled water or maximization of recycled water use for groundwater recharge or seawater water intrusion barrier could help address this challenge. However, groundwater replenishment and seawater barriers are considered non-consumptive uses rather than direct uses offsetting potable demand, which affects Metropolitan recycling target.

- Cost-effectiveness – Even though maximization of landscape irrigation is a goal expressed by some stakeholders involved in the IRWMP, it is limited by the cost-effectiveness of building extensive recycled water distribution systems and converting existing irrigation sites to recycled water use. Most of planned recycled water projects have already identified major cost effective users to serve under current economic conditions (including current funding opportunities).
- Water quality – Regulatory requirements that pertain to the use of recycled water are specifically designed to protect public health. However, some water quality concerns above and beyond public health considerations have been brought up in recent years by users and the Los Angeles Regional Water Quality Control Board. These concerns have typically been related to the TDS concentrations measured in recycled water. It should be noted that maximization of internal conservation measures (e.g., waterless urinals) could further impact recycled water quality issues, by resulting in an increase in salt concentration in the treatment plant influent.
- Regulatory trends – Looking ahead 20 years, a challenge facing wastewater agencies, and ultimately recycled water programs, could be the regulatory trend pushing wastewater agencies towards advanced treatment prior to surface water discharge. This challenge presents two opportunities for the IRWMP: (1) an opportunity to prioritize water-related issues and solutions that provide the basis for agencies to work with regulators on innovative ways to achieve water quality objectives, and (2) an opportunity to improve recycled water quality and allow for recycled water programs expansion.
- Minimum surface water discharge flows – Wastewater agencies discharging to creek/rivers have typically a responsible through their NPDES permit for preserving flow to the river and maintaining habitat that has been created, which can represent an impediment to maximizing recycled water use. A potential solution to this challenge would be to limit the volumetric goal of expanding recycled water use to the equivalent increase in imported water supply.
- Single-purpose agency mission – As shown in Table B-2, there is limited use of recycled water for environmental restoration such as lake or wetland enhancement or creek restoration. From the water and wastewater agency perspective, opportunities for integration are limited by the mission of the agency (e.g., wastewater agency mission in the eye of its ratepayer is to manage wastewater, not to restore habitat). This challenge emphasizes the need for project integration and inter-agency coordination.
- Political/public support – As extensively discussed in the Water Recycling 2030, Recommendations of California's Recycled Water Task Force, the lack of continuous political and public support can still represent a major impediment to recycled water use expansion. This challenge was illustrated in 2000 with the shutdown of the East Valley Water Recycling project implemented by the City of Los Angeles at the Tillman Water Reclamation Plant to recharge the San Fernando groundwater basin.

Other challenges identified by stakeholders are not discussed because a link to the IRWMP has not been clearly established. The issues will be reconsidered as an implementation plan is developed and relevance to the IRWMP goals can be established. Examples of such issues include: pricing set by retailers that does not always provide enough of an incentive for potential users to convert to recycled water use, time and expenses associated with site conversions, or lack of enforceable mandatory use throughout the State for co-generation facilities.

Ocean Desalination

Metropolitan Incentives

In order to diversify the regional water resource mix further, Metropolitan has developed a program to financially assist in the development of seawater desalination. A $250 per acre-feet foot payment for water

produced from an ocean desalination facility helps defray the local cost. This program has helped spur formal study of three seawater desalination plants located in the Los Angeles County Region.

According to the 2003 IRP Update, in 2001 Metropolitan issued a competitive RFP for seawater desalination projects with a goal of developing up to 50,000 acre-feet per year. In light of the enthusiastic response to the proposals submitted under the RFP, Metropolitan has included a revised local resources target that can accommodate a seawater desalination goal of 150,000 acre-feet per year.

Region's Agency Participation

Several plants are under consideration in the planning area. LADWP is studying development of a 25,000 acre-feet/year reverse osmosis seawater desalination facility at the City's Scattergood Power Plant in El Segundo to be on-line prior to 2020. Adjacent to this planned facility is West Basin Municipal Water District's planned 20,000 acre-feet seawater desalination plant at the El Segundo Power Plant. West Basin is currently in pilot-scale testing phases of a reverse osmosis seawater desalination plant with plans to have 5,000 acre-foot of production on-line by 2010 and the remainder on by 2020. Finally, the City of Long Beach, in partnership with LADWP, is in demonstration-scale phase testing of a dual pass nanofiltration technology plant at the Haynes Generating Station in Long Beach. Ultimately, Long Beach envisions a 10,000 acre-feet seawater desalination plant on-line by 2020.

Costs

The biggest components to the cost of desalination are energy and brine disposal. However, a new process has been developed by the City of Long Beach that may significantly reduce the amount of energy required to force the seawater through the membranes. Long Beach estimates that the process will save about 20-30 percent of energy requirements making this supply source more competitive with other supply sources.

Challenges

Ocean water is an unlimited resource. However, there are several potential constraints to expansion of ocean desalination. These include:

- Cost - Desalinated seawater has dropped in price significantly in recent years and the cost of membranes has dropped and membrane efficiency increased. However, energy costs remain significant and product water costs still exceed the marginal cost of other supplies.
- Environmental – Siting of coastal desalination plants has been constrained by the California Coastal Commission and opposed by some environmental groups. The opposition often relates to co-location of plants with coastal power plants. Co-location is believed by some to prolong the effective life of unsightly and environmentally contentious power plants. The impact of brine discharges in the marine environment is believed by some to be significant. Models of salinity impacts have shown no material impact in some settings.
- Water distribution costs associated with pumping coastal water supplies to elevations where it can be used.

Existing Imported and Local Surface Water Supplies

State Water Project

The California SWP is a system of reservoirs, pumps and aqueducts that carries water from north of the Sacramento area to areas north, west and south of the Sacramento-San Joaquin Delta. The project is operated by DWR. The system was designed to deliver slightly more than 4 million acre-feet of water a year.

The two largest contractors are Kern County Water Agency and Metropolitan. Metropolitan's contract is for 2,011,000 acre-feet of water per year – about half the total project.

Variable hydrologic and environmental issues in the San Francisco Bay / Sacramento-San Joaquin River Delta can reduce the quantity of water that the SWP delivers to Metropolitan. Metropolitan projects a minimum dry year supply from the SWP of 650,000 acre-feet, and average annual deliveries of 1.5 million acre-feet. These do not include water from transfer and storage programs along the SWP. The numbers also have not been updated to include the SWP Delivery Reliability Report 2005 figures since that Report has not yet been finalized. However, once that report is finalized and should the findings for a repeat of a single dry year remain as in the draft (a possible 5 percent SWP allocation), the dry year supply from the SWP would likely be reduced.

Metropolitan began receiving water from the SWP in 1972. The infrastructure built for the project has become an important water management tool, especially for Southern California. Metropolitan, among others, has agreements in place to store water at a number of points along the aqueduct, primarily in Kern County. The project facilities can be used to move water hundreds of miles. However, there are certain obstacles that must be overcome to move the water. Chief among those obstacles are water quality and cost. Generally speaking, DWR will not allow water in their aqueduct that is of lower quality than its own water. DWR also requires payment for use of facilities and power.

Colorado River

California has a basic apportionment of 4.4 million acre-feet of Colorado River Water (CRW). Historically, California had been taking over a million acre-feet more than its basic apportionment. This was allowed by the Bureau of Reclamation (managing authority of CRW) under a surplus provision. As Arizona and Nevada are gradually increasing water use towards their full CRW apportionment, both Metropolitan and the State of California understand that they will receive less CRW in the future than they had in the past. Metropolitan together with other CRW users developed California's Colorado River Water Use Plan (California Plan). This plan identifies measures to reduce California's use of CRW.

Out of the 4.4 million acre-feet allotment, the first 3.85 million acre-feet are assigned in aggregate to the agricultural agencies along the river – primarily the Palo Verde Irrigation District, the Imperial Irrigation District and the Coachella Valley Water District (Coachella). Subtracting that amount from 4.4 million yields Metropolitan's fourth priority allotment of 550,000 acre-feet. Until only a few years ago, Metropolitan routinely had access to 1.3 million acre-feet of water because the states of Arizona and Nevada had not been using their full entitlement and there were years when the Colorado River ran high, yielding surplus water that was made available to California and thus to Metropolitan.

In sum, the Colorado River was once the base supply of Metropolitan's system. Indeed, the district was formed in 1928 for the specific purpose of building the Colorado River Aqueduct to deliver Colorado River water to the coastal plain of Southern California. The district began using the full capacity of the system in the early 1960s and in 1972 began taking deliveries from the SWP originating in northern California. Today, with a base demand that fluctuates between 1.6 million acre-feet and 2.3 million acre-feet a year, Metropolitan has become more reliant on the SWP. This shift, plus a number of water resources programs involving storage and transfers, enables Metropolitan to meet demand with only the slightest margin to accommodate growth and changing hydrology. Agencies depending on Metropolitan and its member agencies are becoming more convinced that they must accept some responsibility for meeting future water demands on their own.

Los Angeles Aqueduct

The Los Angeles Aqueduct delivers a significant amount of high-quality water to Los Angeles. For nearly a century now, it has remained in operation, delivering a safe and reliable water supply from the Eastern Sierra Nevada.

Having utilized much of the local groundwater supply and needing more water to support future growth, the City in 1913 built the First Los Angeles Aqueduct, tapping into the waters of the Owens River to support a growing population to the south. In 1940, the City extended the first aqueduct 40 miles north to tape into high-quality streams that were tributaries to Mono Lake. Needing additional capacity to augment deliveries by its first aqueduct, the City completed construction of the Second Los Angeles Aqueduct in 1970 which doubled the City's ability to deliver water from the Mono Basin and Owens Valley to Los Angeles.

Los Angeles Aqueduct deliveries have, on average, supplied about half of the City of Los Angeles' water needs over the last ten years.

Los Angeles River

The Los Angeles River travels a 51 mile course through Los Angeles County. It flows eastward from the union of Bell Creek and Arroyo Calabasas in San Fernando Valley, then southeast through the city of Burbank and eventually discharges into San Pedro Bay. Originally, the Los Angeles River was the primary water source for the Los Angeles Basin, until a series of floods in the 1930s plagued the river. In an effort to reduce flooding, the Army Corps of Engineers encased most of the river beds and banks. Today, the river is primarily fed from urban runoff, although the Santa Monica and San Gabriel Mountains watersheds also contribute flow, and it serves as a flood control channel. Figure B-2 presents an aerial photo showing the Los Angeles River and the San Gabriel River.

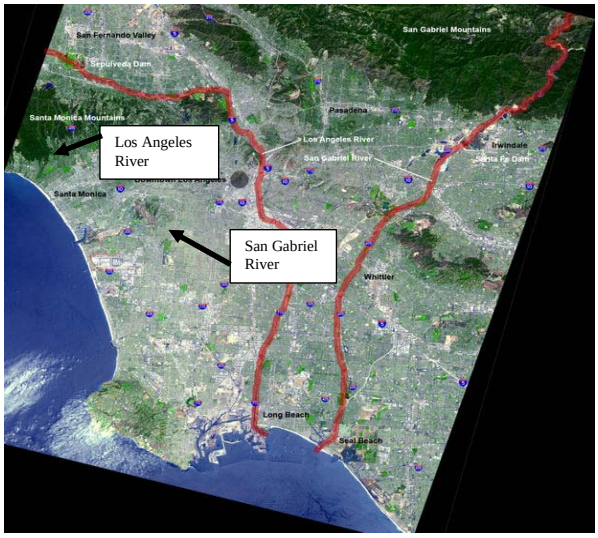

Figure B-2. Los Angeles River and San Gabriel River (Courtesy: Wikipedia.org)

The Los Angeles River Watershed covers 834 square miles from the eastern portions of Santa Monica Mountains, and Simi Hills, and Santa Susana Mountains to the San Gabriel Mountains in the west. The watershed encompasses and is shaped by the path of the Los Angeles River. There are eight major tributaries to the Los Angeles River as it flows from its headwaters to the Pacific Ocean. The major tributaries of the Los Angeles River include Burbank Western Channel, Pacoima Wash, Tujunga Wash, and Verdugo Wash in the San Fernando Valley; and the Arroyo Seco, Compton Creek, and Rio Hondo south of the Glendale

Narrows. The Los Angeles River Watershed has 22 lakes within its boundaries including Devil Gates Dam, Hansen Basin, Lopez Dam, Pacoima Dam, and Sepulveda Basin. In addition, there are a number of spreading grounds in the watershed including sites at Dominguez Gap, the Headworks, Hansen Dam, Lopez Dam, and Pacoima Dam. The Los Angeles River is hydraulically connected to the San Gabriel River through the Whittier Narrows Reservoir, although this occurs primarily during large storm events.

The Los Angeles River, along much of its course, had intermittent flow during much of the year prior to channelization. In addition, many of its tributaries did not reach the river except during storm events. The current flow in the river is effluent dominated with approximately 80 percent of its flow originating at dischargers and the remaining flow coming from storm drain runoff and groundwater reaching the surface.

The Los Angeles River Watershed has impaired water quality in the middle and lower portions of the basin due to runoff from dense clusters of commercial, industrial, residential, and other urban activities. The 1998 303d list identifies that the impairments in a majority of the watershed are due to point and nonpoint sources. These impairments include the following: pH, ammonia, a number of metals, coliform, trash, scum, algae, oil, chorpyrifos as well as other pesticides, and volatile organics.

The City of Los Angeles, together with DWR, began developing the Los Angeles River Revitalization Master Plan. The primary goals for this master plan include:

- Establish environmentally sensitive urban design guidelines, land use guidelines, and development guidelines for the River zone that will create economic development opportunities to enhance and improve River-adjacent communities by providing open space, housing, retail spaces such as restaurants and cafes, educational facilities, and places for other public institutions.
- Improve the environment, enhance water quality, improve water resources, and improve the ecological functioning of the River.
- Provide public access to the River.
- Provide significant recreation space and open space, new trails, and improve natural habitats to support wildlife.
- Preserve and enhance the flood control features of the River.
- Foster a growth in community awareness of the Los Angeles River, and pride in the Los Angeles River.

San Gabriel River

The San Gabriel River traverses a 75 mile stretch through Los Angeles County. It originates in the San Gabriel Mountains and flows southwest through western San Gabriel Valley, then southward at Whittier Narrows and discharges into the Los Angeles Basin. Similar to the Los Angeles River, the San Gabriel River is partially channelized with cement, used for flood control, and is substantially fed from urban runoff and wastewater effluent. Efforts to restore either river have been challenging due poor water quality.

The County of Los Angeles Board of Supervisors directed the Department of Public Works (LACDPW) to prepare a master plan for the San Gabriel River corridor in 1999. The San Gabriel River Corridor Master Plan emerged from a multi-year community-based planning process that began when the LACDPW established a Steering Committee composed of the 19 cities along the river, water and regulatory agencies, interested community, business, and environmental groups; and other stakeholders. Over the past several years, the members of the Steering Committee reached consensus around which the Master Plan was developed.

The Master Plan for the San Gabriel River provides a shared, comprehensive vision of the river corridor, from the mountains to the ocean. It integrates the multiple goals of enhancing habitat, recreation and open space, while maintaining and enhancing flood protection, water supply and water quality.

Malibu Creek

Malibu Creek is part of a watershed that reaches from east Ventura County, through the Santa Monica Mountains and discharges in the Santa Monica Bay. The watershed is discrete, but spreads 109 square miles through residential and park areas. There are current efforts to protect and restore the watershed, but increased urbanization has led to water quality and quantity issues.

Over 90,000 residents in five cities and unincorporated areas of Los Angeles County live within the watershed boundary. Some animal species, such as the steelhead trout, tidewater goby and brown pelican are endangered. Many others, such as the snowy plover and peregrine falcon, are threatened. The watershed also hosts the popular Malibu Creek State Park, many hiking/biking trails, and spectacular scenery spanning from the ocean to the mountains.

Increased urbanization has resulted in water quality and quantity issues as well as loss of critical habitat within the Malibu Creek watershed. The Malibu Creek Watershed Advisory Council developed action items outlined in the 1995 Malibu Creek Watershed Natural Resources Plan to improve the watershed's current condition. Figure B-3 shows Malibu Creek Watershed on the regional map.

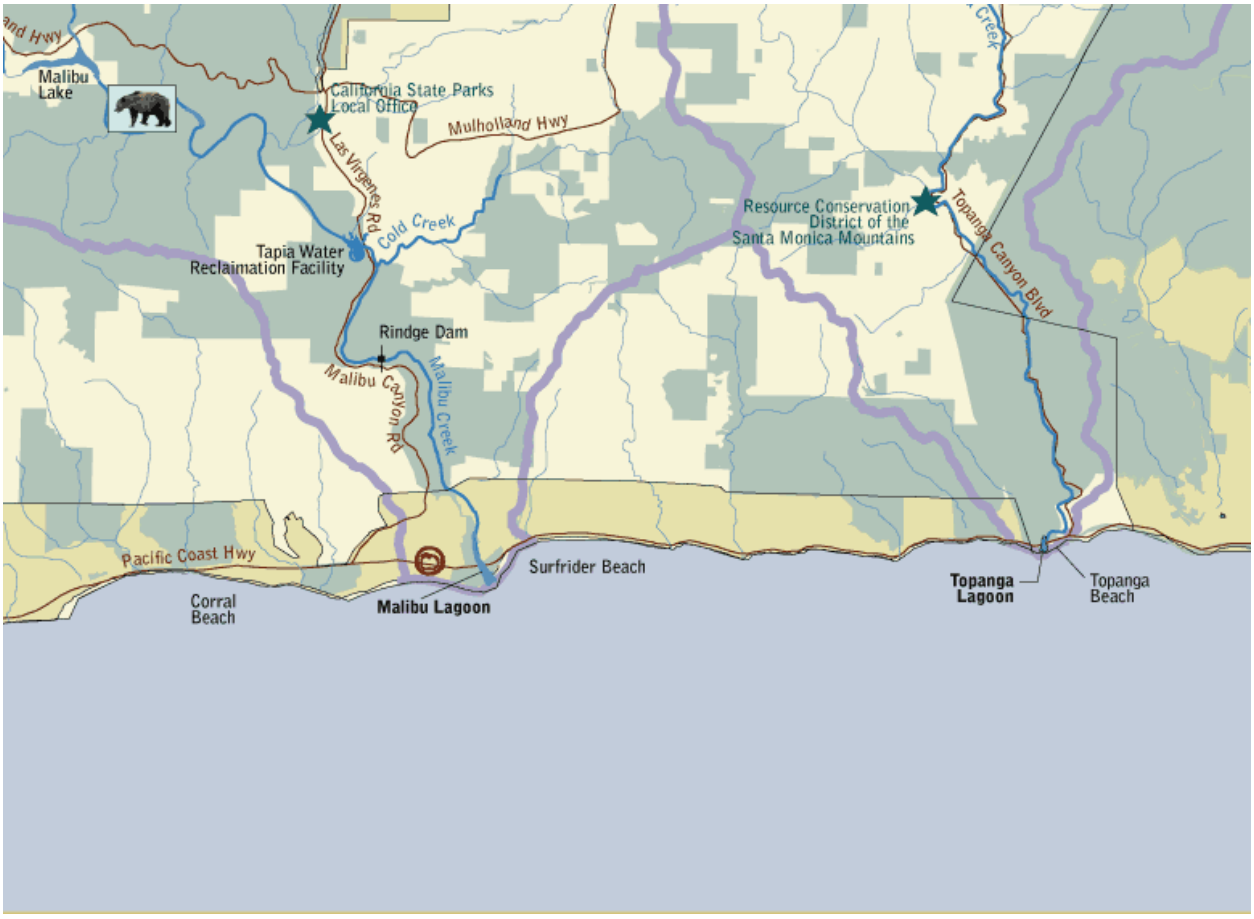

Figure B-3. Malibu Creek Watershed (Courtesy: Malibu Creek Watershed Advisory Council)

Stormwater

Stormwater runoff can become a valuable water resource which can be added into the water supply portfolios to meet increasing demands of a community. The primary benefit of stormwater management includes improving flood protection, and reducing point source pollution. Additional benefits may include increased water supply through groundwater recharge, improved wildlife habitat, parks, and open spaces.

Los Angeles County recharges an average 210,000 acre-feet of storm runoff a year, which reduces the need for expensive imported water. The Los Angeles and San Gabriel Watershed Council has estimated that if 80 percent of the rainfall that falls on just a quarter of the urban area within the watershed (15 percent of the total watershed area) was captured and reused, total runoff would be reduced 30 percent. This translates into a new supply of 132,000 acre-feet of water per year which is enough to serve the supply needs of 800,000 people for a year. Once a planned area is proposed, approximate supply yield can be estimated.

Santa Monica is an example of a municipality that is taking a watershed approach to manage urban runoff. This turns a perceived waste product into a viable local water resource. Through the watershed management project, the City not only improved the water quality of the runoff, but it harvested a new water resource that reduced the City's dependence on Metropolitan's imported water. Santa Monica and Los Angeles jointly built the Santa Monica Urban Runoff Recycling Facility (SMURRF) which is capable of treating 500,000 gallons of stormwater per day by using conventional and advanced treatment systems.

Surface Water Storage

Metropolitan's Reservoirs

Metropolitan operates a total of nine open reservoirs: Diamond Valley Lake in Hemet, capacity of 800,000 acre-feet; Lake Mathews in Riverside, 182,000 acre-feet; Lake Skinner in Winchester, 44,000 acre-feet; Copper Basin in Gene, 24,200 acre-feet; Gene Wash in Gene, 6,300 acre-feet; Live Oak in La Verne, 2,500 acre-feet; Garvey in Monterey Park, 1,600 acre-feet; Palos Verdes in Rolling Hills, 1,100 acre-feet; and Orange County in Brea, 212 acre-feet. The combined storage of 1,062,000 acre-feet is distributed via 775 miles of pipelines and about 400 connections to member agencies.

Among the nine reservoirs, Diamond Valley Lake (DVL) is the newest and largest reservoir in the Region. It provides critical water storage south of the Sacramento-San Joaquin Delta and within the urban Southern California region west of the San Andreas Fault. When full, it can provide enough water to meet emergency (earthquake) and drought needs for six months. As well as being a major water source, DVL is a source of hydroelectric power. It has maximum generation abilities of 40 megawatts or enough power for 40,000 homes for a year.

Diamond Valley Lake is located a few miles south of the San Diego/SWP canal juncture permitting a tie-in of its delivery system. It receives and blends water from two sources- the Colorado River and the State Project. Colorado River water is delivered to DVL from the Colorado River Aqueduct via the San Diego Canal and SWP water comes from Lake Silverwood. The lake's elevation of 1,500 feet above sea level allows it to deliver water by gravity flow to 95 percent of Metropolitan's service area.

The second largest reservoir operated by Metropolitan is Lake Mathews. It is located in the foothills of the Santa Ana Mountains in Riverside County. Operation of the lake began in October 1961 and it was filled in 1962. The storage capacity of Lake Matthews is 182,000 acre-feet.

Metropolitan also has access to water stored in Castaic Lake and Lake Perris for use as needed. The terms for use of these waters is detailed in an agreement between the State and the SWP contractors commonly referred to as the Monterey Agreement. Water withdrawn from the lakes must be replaced within 5 years. If

not replaced by the contractor, DWR will replace the water from the contractor's delivery allotment in the 6th year.

Cogswell, San Gabriel, and Morris Dams

LACDPW oversees several surface water storages. Fourteen dams were constructed as part of the San Gabriel River and Montebello Forebay water conservation system to impound San Gabriel Mountain stormwater before releasing for downstream spreading and groundwater recharge. Stormwater is captured by the three dams- Cogswell, San Gabriel, and Morris. Cogswell Dam and San Gabriel Dam are situated in San Gabriel Canyon while Morris Dam is located a few miles downstream of San Gabriel Dam. Once released, stormwater flows to Santa Fe Dam. The upper portion of this dam is the Santa Fe Spreading Grounds is capable of percolating approximately 400 cubic feet per second continuously.

Las Virgenes Reservoir

Las Virgenes Municipal Water District (LVMWD) imports all its drinking water. It purchases pretreated water from Metropolitan and stores it in Las Virgenes Reservoir. Las Virgenes Reservoir is the sole source of drinking water in the LVMWD Service Area which covers the cities of Agoura Hills, Calabasas, Hidden Hills, Westlake Village and neighboring unincorporated areas of Los Angeles County. The reservoir also provides seasonal water storage allowing LVMWD to purchase supplies off-season and deliver at times of peak demand to meet high summer irrigation needs. It increases the ability to meet peak summer demands by creating a second supply at the west end of the service area.

Las Virgenes Reservoir is located immediately south of Westlake Lake in the hills of the City of Westlake Village in Los Angeles County. With a storage capacity of 10,000 acre-feet of water or 3 billion gallons, it can hold up to six months supply of water.

Los Angeles In-City Reservoirs

The in-city water distribution systems of the City of Los Angeles obtain water from a few open reservoirs in the immediate area to supply the city's consumption of approximately 660,000 acre-feet annually. The City of Los Angeles once operated 15 open distribution reservoirs. However, these open water storages have been under the threat of contamination resulting from algae, small aquatic organisms, microbes, airborne particles, birds, and surface runoff. Thus, in 1974 the California State Department of Health Services directed LADWP to improve and protect the water quality of its open reservoirs. Since then, nine reservoirs have been bypassed, replaced, or covered.

Several open reservoirs have been replaced by buried storage tanks. The Upper and Lower Hollywood Reservoirs that used to serve the Hollywood area were replaced by two 30-million gallon tanks buried in the Hollywood Hills in July 2001. In December 2002, Encino Reservoir was removed from service and a small storage tank and small microfiltration plant replaced the open storage. The Encino Reservoir is located in the Santa Monica Mountains about 17 miles northwest of downtown Los Angeles. The Encino service area serves 100,000 customers in the Encino, Tarzana, and surrounding areas of the San Fernando Valley. In addition to potable water, Encino Reservoir also provided water for emergencies, fire fighting, and stormwater protection.

The Stone Canyon Reservoir Complex is another reservoir which has undergone system improvements. The complex comprises two reservoirs- an upper and a lower which were receiving treated water from the Los Angeles Reservoir. The improved system will allow a higher volume of this water to bypass the Lower Stone Canyon Reservoir and be directly delivered to customers. Together the Lower and Upper Stone Canyon Reservoirs serve 400,000 customers in Pacific Palisades, the Santa Monica Mountains, and West Los Angeles.

Los Angeles Reservoir is one of the major remaining open reservoirs. It replaced the Van Norman Reservoirs which were damaged in the 1971 earthquake. It has a capacity of 10,000 acre-feet and is a primary water source of the San Fernando Valley area. Removal of the Los Angeles Reservoir was not a viable option and a floating cover was proposed to protect its water quality.

Conservation

In general, the information presented below is based on the following documents (see Reference section for exact references):

- Metropolitan 2003 IRP Update;
- City of Los Angeles 2005 IRP;
- Metropolitan 2005 RUWMP;
- Metropolitan and San Gabriel Valley MWD member agencies 2005 UWMPs; and
- Agency BMP coverage and annual reports to California Urban Water Conservation Council (CUWCC)

Additional information was obtained from the following sources:

- Workshop 1 and Workshop 2 meeting minutes for all sub-regions.

Since the drought of 1987-1992, conservation efforts have increased significantly within the planning area. This section reviews conservation and water efficiency strategies that are currently employed. The agencies practice and promote water conservation to varying degrees. The focus in this section is on the Metropolitan member agencies as their conservation practices are well documented and their efforts directly affect all other agencies within the planning area. Similar practices are undertaken by the San Gabriel Valley MWD member agencies.

Metropolitan Conservation Target

Metropolitan has incorporated conservation into its long range water supply plans in its IRP. It sets a target of a total of 1.1 million acre-feet of conservation (relative to a 1980 baseline) by 2025 within its service area. In 2005, Metropolitan reports that 736,000 acre-feet had already been achieved, suggesting that approximately 400,000 acre-feet of conservation remains for Metropolitan and its member agencies to achieve.

Conservation goals for the Region have not yet been established, however, using the Metropolitan IRP goal as a benchmark would imply that a regional conservation goal of approximately half of the remainder (in proportion to the percentage of water that is delivered into the Region compared to the overall Metropolitan service area) would be a reasonable starting point. This suggests a minimum conservation goal by 2025 of 200,000 acre-feet.

Both Metropolitan and its member agencies have been proactive in promoting conservation within the planning area. Metropolitan and all but two of its member agencies belong to the CUWCC. Metropolitan provides a great deal of funding to support a variety of conservation programs through its member agencies.

Water Conservation Best Management Practices Measures (BMPs)

The CUWCC has established a set of 14 .BMPs for water conservation. The BMP titles are listed in Table B-3. All but one of the Metropolitan member agencies within the planning area are signatories to a MOU with the CUWCC agreeing to implement these BMPs. Retail agencies were required to meet all BMPs except for BMP 10. Wholesale agencies were required to meet BMPs # 3, 7, 8, 10, 11 and 12. Only 16 MWD subagencies are MOU signatories. San Gabriel Valley MWD is not a signatory to the MOU. Success in achieving BMP implementation is measured according to criteria set by the MOU.

Annual BMP reports submitted to the CUWCC by Metropolitan member agencies within the planning area were analyzed to determine the extent of BMP compliance and identify opportunities for further conservation. Table B-3 summarizes member agencies' success in meeting the MOU-established criteria for each applicable BMP. The member agency cities of Compton, San Fernando, and San Marino did not submit BMP reports to CUWCC in 2004 and are not included in the table. The member agency city of Beverly Hills is not an MOU signatory; however, information from the city's UWMP was used to determine if the city would have met BMP requirements. The analysis only considers Metropolitan member agencies and provides only a sample of data. There are over 80 additional water agencies within the Region that are responsible for implementing water conservation measures.

Table B-3. 2004 BMP Implementation Status for Metropolitan Member Agencies in IRWMP Region

MEMBER AGENCY	BMP 1	BMP 2	BMP 3	BMP 4	BMP 5	BMP 6	BMP 7	BMP 8	BMP 9	BMP 10*	BMP 11	BMP 12	BMP 13	BMP 14
	Water Survey Programs for Residential Customers	Residential Plumbing Retrofit	System Water Audits, Leak Detection and Repair	Metering with Commodity Rates for New and Existing Connections	Large Landcape Conservation Programs and Incentives	High Efficiency Washing Machine Rebates	Public Information Programs	School Education Programs	Conservation Programs for CII accounts	Wholesale Agency Assistance Programs	Conservation Pricing	Conservation Coordinator	Water Waste Prohibition	Residential ULFT Programs
Retail														
Beverly Hills, City of	N	Y	N	Y	N	Y	Y	Y	N		Y	N	N	N
Burbank, City of	N	N	Y	N	N	Y	Y	Y	N		N	Y	N	Y
Fullerton, City of	N	Y	Y	Y	N	Y	Y	Y	N		Y	Y	Y	Y
Glendale, City of	N	N	Y	Y	N	Y	Y	Y	Y		Y	Y	N	N
Las Virgenes MWD	N	N	Y	Y	N	Y	Y	Y	Y		N	Y	Y	Y
Long Beach, City of	N	Y	Y	Y	N	Y	Y	Y	N		Y	Y	N	Y
Los Angeles, City of	N	Y	N	N	N	Y	Y	Y	Y		Y	Y	N	Y
Pasadena, City of	N	Y	Y	N	N	Y	Y	Y	Y		Y	Y	N	Y
Santa Monica, City of	N	Y	N	Y	N	Y	Y	Y	N		Y	Y	Y	Y
Wholesale														
Calleguas MWD			Y				Y	Y		Submission of BMP 10 information is required but CUWCC does not evaluate coverage	Y	Y		
Central Basin MWD			N				Y	Y			Y	Y		
Foothill MWD area			N				N	N			Y	N		
MWDOC			N				Y	Y			Y	Y		
Three Valleys MWD			N				Y	Y			N	Y		
Upper San Gabriel MWD			N				Y	N			Y	Y		
West Basin MWD			N				Y	Y			Y	Y		
MWD			Y				Y	Y			Y	Y		
BMP Coverage Ratio	0/9	6/9	7/16	6/9	0/9	9/9	15/16	14/16	4/9		13/16	14/16	3/9	7/9
BMP Coverage Percentage	0%	67%	44%	67%	0%	100%	94%	88%	44%		81%	88%	33%	78%

* The status of BMP 10 (Wholesale Agency Assistance Programs) is not reported by CUWCC

Y	CUWCC REQUIREMENTS MET (2004)
N	CUWCC REQUIREMENTS NOT MET (2004)
	BMP NOT REQUIRED

Notes:
Source: UWMPs, CUWCC BMP annual reports
1. Only BMPs # 3, 7, 8, 10, 11 and 12 apply to Wholesale agencies.
2. The status of BMP 10 is not reported by the CUWCC so it is not included in the table.
3. The Cities of Compton and San Fernando are MOU signatories but did not submit BMP reports.
4. The City of Beverly Hills is not an MOU signatory, but information from its UWMP was analyzed to determine the equivalent BMP status.
5. The City of San Marino is not an MOU signatory and its UWMP was not available.

According to the Table B-3, 8 BMPs have achieved a reasonable degree of successful coverage with Metropolitan member agencies in within the planning area (>50 percent agency implementation), while the remaining 6 BMPs have achieved lower levels of implementation. The BMPs and a discussion of factors affecting BMP implementation are provided below.

- BMP 1 Water Survey Programs for Single-Family and Multi-Family Residential Customers. The main element of this BMP is a residential water survey conducted by trained personnel who will check for leaks inside and outside a residence and provide recommendations for more efficient water use, including the use of water conservation devices. None of the retail member agencies were able to meet the requirements under this BMP. Many had not developed the required "Survey Targeting and Marking

Strategy". The majority of retail member agencies have offered surveys to their customers, but at levels less than the MOU requires. A major obstacle to implementation of this BMP may be staffing limitations.

- BMP 2 Residential Plumbing Retrofit Programs. This BMP is designed to encourage the replacement of existing residential plumbing with low flow devices. Most agencies have had reasonable success implementing this BMP. Agencies that did not successfully implement had a lower rate of replacement than the MOU criteria, however all agencies did offer retrofit programs. As time goes on, this market approaches saturation as existing devices are replaced.
- BMP 3 System Water Audits, Leak Detection and Repair. This BMP was implemented very successfully by retail member agencies. The main reason for wholesalers not satisfying the MOU criteria is because most of them do not control their own potable water lines and were unable to conduct audits. This presents an opportunity for programs to ensure that the lines of the retail agencies supplied by these wholesalers are properly surveyed.
- BMP 4 Metering with Commodity Rates for all New Connections and Retrofit of Existing. Almost all agencies within the planning area are 100 percent metered.
- BMP 5 Large Landscape Conservation Programs and Incentives. No member agencies were able to report successful coverage of the Large Landscape Conservation Programs and Incentives. This was mainly due to the lack of water budget development for dedicated landscaped metered accounts as well as difficulty in meeting the annual 20 percent survey requirement. Landscape irrigation conservation may provide one of the more significant opportunities to impact water use as it is one of the more discretionary uses of water.

  Most agencies are active in some form of landscape conservation through the promotion of programs such as Protector del Agua programs and/or California Friendly landscape education program in conjunction with Metropolitan. Many agencies showcase water friendly gardens.
- BMP 6 High Efficiency Washing Machine Rebate. The High Efficiency Washing Machine Rebate Programs have been the most successful, with all reporting agencies meeting the BMP criteria. This program is driven by Metropolitan which funded $3.5 million towards rebates in 2004. The wholesaler agencies in turn provided rebates to their customers. This is an active and directly measurable conservation action.
- BMP 7 Public Information Programs. Agencies have been very successful in implementing both the Public Information and School Education BMPs, which focus on creating public awareness of water conservation.
- BMP 8 School Education Programs. Agencies have been very successful in implementing both the Public Information and School Education BMPs, which focus on creating public awareness of water conservation.
- BMP 9 Conservation Programs for Commercial, Industrial and Institutional Accounts. The BMP for Conservation Programs for Commercial, Industrial and Institutional (CII) Accounts has been implemented by most member agencies. In 2004, Metropolitan funded $4.5 million towards this program.
- BMP 11 Conservation Pricing. Most agencies have implemented Conservation Pricing structures. Metropolitan already has a tiered rate structure and most of the member agencies replicate this structure to their customers.
- BMP 13 Water Waste Prohibition. Three of the retail member agencies successfully implemented this BMP. The BMP requires some enacting specific prohibitions on gutter flooding and certain single-pass usages of water. Most agencies have water conservation ordinances; however they do not always include the specific prohibitions required under this BMP.
- BMP 14 Residential ULFT Replacement Programs. Metropolitan provided $9.2 million towards member agencies efforts in implementing this BMP. This funding goes toward rebates or distribution programs.

As a result, nearly all of the member agencies within the planning area were able to meet the BMP criteria in 2004.

In summary, BMPs represent a benchmark for water conservation actions that have developed and approved by consensus for the majority of water agencies in California. The Metropolitan member agencies as a whole have been successful in implementing most of the BMPs. The largest potential for additional conservation remains in the category of Large Landscape Conservation Programs and Incentives.

Metropolitan Conservation Credits

Through the Conservation Credits Program, Metropolitan provides the financial basis for water conservation programs initiated by its member agencies. The essence of the program is that Metropolitan will provide the lesser of $154 per acre-feet of water saved or one half of the program cost. Projects funded under this program must 1) have demonstrable water savings, 2) reduce water demands on Metropolitan's system and 3) be technically sound and require Metropolitan's participation to make the project financially and economically feasible. The importance of this program is that it provides a tremendous stimulus for Metropolitan member agencies in implementing their own water conservation projects.

Other Conservation Practices

While the MOU provides a detailed set of conservation measures, there are number of additional conservation actions that are being implemented by other agencies and could be considered for implementation within the planning area.

Metropolitan Water Conservation Program

Metropolitan has developed a number of water conservation programs (Table B-4) that can be readily employed by its member agencies.

Table B-4. Metropolitan Non-BMP Conservation Actions

Program	Description
BeWaterwise.com	Website that provides links to conservation information, tools and Metropolitan conservation programs
Residential Rebate Programs	Rebate program offered through member agencies for a variety of residential water conserving devices.
Save Water, Save a Buck	An aggressive rebate program tailored specifically for the Commercial Sector. Rebates and incentives are available to business, industry and institutional water customers on water-saving devices.
City Makeover Program (California Friendly Home Program)	Competitive grant program to provide funding for new Southern California Heritage landscapes in prominent public locations with Metropolitan's service area.
Innovation Conservation Program	Grant Program to allow customers to explore the water savings potential and practicality of new water conserving technologies.
Protector del Agua	Residential and Professional programs that teach water efficient methods for landscape maintenance and irrigation.

Source: http://www.bewaterwise.com

Regional Variability of Water Use

The variability of water use within the planning area is an important factor to consider in developing conservation strategies. In general, strategies should focus on those areas where per capita usage is highest as these present the greatest opportunity for water conservation.

- There is a significant variation among agencies in the reliance on imported water and in the overall mix of water sources used for supply. Agencies that use groundwater will have more buffer in times of drought.
- The average per capita water use for Los Angeles County based on Metropolitan's 2005 RWMP is approximately 190 gallon per day per capita (gpcd). There are however significant variations within the planning area as shown in Table B-5.

Table B-5. Per Capita Water Usage by Agency

Agency	Per capita usage (gpcd)
Beverly Hills, City of	270
Burbank, City of	203
Calleguas MWD	192
Central Basin MWD	140
Foothill MWD area	233
Fullerton, City of	212
Glendale, City of	138
Las Virgenes MWD	NA
Long Beach, City of	151
Los Angeles, City of	157
Pasadena, City of	195
Santa Monica, City of	136
Three Valleys MWD	211
Upper San Gabriel MWD	240
West Basin MWD	193
Metropolitan	190

Source: UWMPs, CUWCC BMP annual reports.
NA: not available

Differences in per capita usage can be attributed to a number of factors including the proportion of multi-family housing (which has less irrigation demands) and water conservation programs. Such local variations in per capita consumption and the underlying causes should be considered in prioritizing regional water conservation efforts.

Conservation Potential

To establish quantifiable goals for conservation for the IRWMP, it is important to identify the potential for conservation. Water use generally falls under three categories and the potential for conservation is described for each of these categories.

Residential Indoor Use - The residential sector offers conservation potential in terms of conversion to water saving devices such as Ultra Low Flush Toilets, Low Flow Showerheads and influencing behavior. Grey water use is also an opportunity. A challenge in this sector is that many markets are reaching saturation in terms of

retrofit. Remaining efforts include identifying areas with remaining potential and ensuring that new development installs water saving devices.

Commercial, Industrial and Institutional (CII) Use - The CII sector offers many opportunities for conservation potential. Since water use in the sector is very broad, there is a variety of conservation devices available.

Landscape Irrigation Use - Landscape irrigation is one of the largest areas of discretionary use and thus has much potential for conservation. Large landscaped areas such as parks and schools offer the most immediate opportunity for conservation through the use of more efficient systems such as Weather Based Irrigation Controllers. Other opportunities exist in the area of residential landscaping where the use of irrigation controllers or native landscaping would result in additional water saving.

Member agency goals – Some member agencies have established conservation goals in their UWMPs as shown in Table B-6.

Table B-6. Member Agency Conservation Goals

Agency	Current Conservation (acre-feet/year)	Conservation Goal by 2030 (acre-feet/year)	Additional Conservation (acre-feet/year)
Central Basin	21,100	58,400	37,300
Los Angeles DWP	90,900	121200	30,300
West Basin	14,500	42,800	28,300

Source: UWMPs

To develop firm estimates of conservation potential, additional information is needed. Table B-7 gives example of the types and format of information needed. These estimates would be used to inform the development of integrated projects and programs that can be used to accomplish the IRWMP goals.

Table B-7. Example Information Needed to Fully Assess Conservation Potential

Type of Use	Information Needed	Units
Residential	Areas of low market saturation	Square Miles
Commercial, Industrial, Institutional	Types of businesses and water usage	acre-feet of water categorized by use
Landscape	Area of parkland, irrigated landscape	Acres

Drought Planning

Metropolitan has developed a Water Shortage and Drought Management plan (WSDM) which seeks to provide 100 percent reliable service for the next 25 years including periods of drought. The plan involves increased emphasis on developing local storage options and taking advantage of surplus years to bank water for dry periods. Increasing water efficiency is an important aspect of the WSDM.

Most of the agencies within the planning area have adopted water contingency plans that call for stages of water conservation up to 50 percent. These typically will be activated by the City Council in response to defined drought conditions.

Challenges

Key challenges associated with increasing conservation that should be considered in the development of the IRWMP are discussed below, along with potential pathways to addressing these challenges through the IRWMP.

- Influencing user behavior. This can be done through ordinances that require water savings devices or penalize water waste generation. However, it may be difficult to enact legislation, especially during non-drought times. Incentives such as rebates help by inducing the use of water conserving devices. Pricing structures also provide an incentive to minimize water use. The awareness of the importance of water conservation combined with incentives for low water use devices can influence user behavior.
- Baseline demand reduction. A certain amount of water will be necessary for any given activity and to maintain a given quality of life. As the population grows, increases in this baseline water demand will also grow. The challenge is to minimize the per capita demand. This is being accomplished through technological innovation in of water efficient devices.
- Water conservation performance measurement. Some programs such as education create public awareness, but the effects are indirect and difficult to measure. Even the actual effect of water conserving devices can be hard to quantify. Simply put, water "not used" is sometimes a difficult concept to grasp. On a practical level, cost benefit analysis is difficult to perform and water conservation spending may be more difficult to justify. The difficulty in measuring conservation can make goal setting in the arena of conservation more difficult as well as the measurement of progress. A corollary to this is how to ensure that the water saved does not simply get used elsewhere. It will be important to dedicate water saved towards other beneficial use.
- Agency challenges include limited staff resources for actions such as performing surveys. There is also less urgency in times of water surplus to request residential and landscape surveys. Code-based conservation can be effective but can be more difficult to implement. As the level of impact increases, public resistance will tend to increase.